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Volume 3 | DECEMBER, 1938 | Number 3

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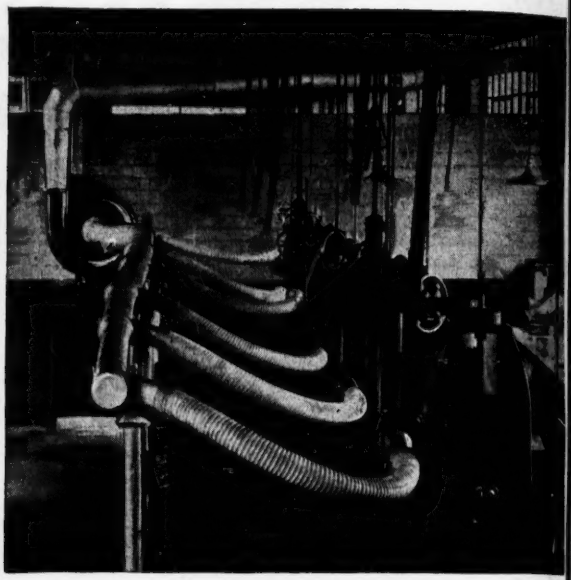

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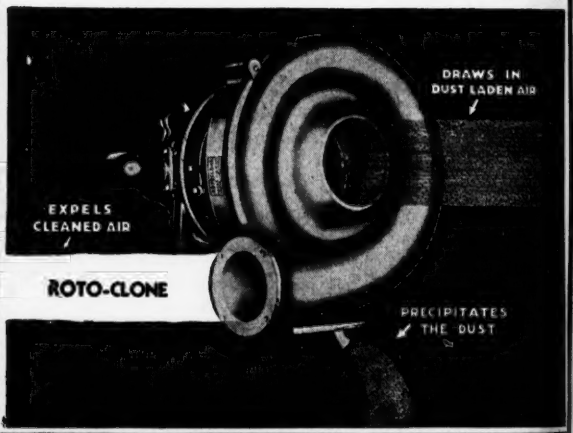

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CINCINNATI, OHIO VOL. 3, NO. 3

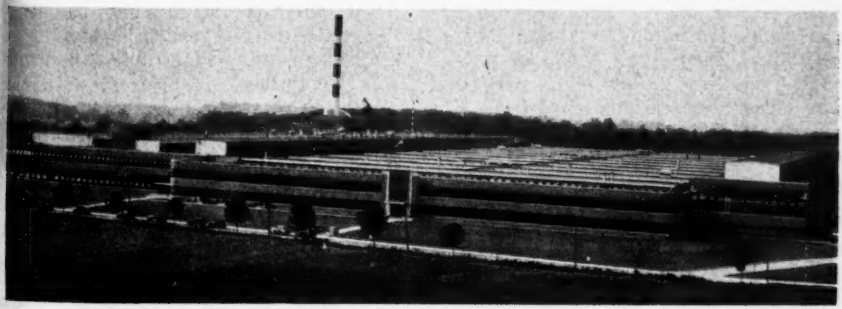
DECEMBER, 1938

Ultramodern Design of Finishing Departments Features Auto Parts Plant

The author describes the most interesting finishing processes of the new Ternstedt plant, Trenton, New Jersey

BY JAMES P. WINES

THE latest developments in the science of handling and routing materials in their transition from raw to finished products, in which the principle of straightline flow of materials and a reduction of unnecessary physical exertion served as the governing factor, have been achieved in



View of the new 20-acre Ternstedt plant located at Trenton, New Jersey.

Fig. 1—The heads of this rotary polisher are designed so that work-pieces being finished are properly polished on every face and in every corner and crevice.

the layout of departments, arrangement of equipment and disposition of various operations.

Practically every handling operation of the finishing department in the Ternstedt plant located at Trenton, New Jersey, is completely mechanized through the use of monorail conveyors, conveyor belts, elevators or chute-fed bins. More than that, the materials handling equipment, whatever its nature, is designed to deliver the work at the correct table level, so that bending or reaching on the part of the operator is totally unnecessary.

The plant, which contains approximately 900,000 sq. ft. of floor space, is devoted to the manufacture and finishing of body hardware and fittings for shipment to assembly plants in the East and South. Approximately 787 different items must be manufactured, finished and assembled to provide the hardware needed for a single body, and it would be economically unsound to attempt to provide individual lines for each of these parts. As a consequence, 70 per cent more space than would otherwise be required is contained in a warehouse to provide for a rotating production scheme and a large inventory of completed units.

The finishing department proper occupies two areas, one 50 ft. and the other 70 x 640 ft., with a light well 25 ft. wide between. The side walls of these units are constructed of glass brick, which is said to afford the same resistance to temperature changes as a 12-in. masonry wall. Air taken into this department is filtered, with the exception of two rooms, approximately 40 ft. square, where the graining is done. In these two rooms, the air is fully conditioned.

The sections of the new plant devoted to polishing and packing are extensions of the finishing department. They are of the same widths and extend 280 ft. to the front of the building.

The parts that are fabricated and

finished in this plant include such items as window regulators, seat adjustments, locks and hinges, roof bows, sash and garnish moldings, door handles, and frames for the Fisher No-Draft Ventilation System. The window frames that come from the fabrication department are hooked to the monorail that transports them to the metal-finishing section. Here they are disc polished to prepare the metal for painting. These window frames are polished on No. 80 wheels, oil polished on No. 120 wheels and then inspected. The frames are then ready for the finishing department. Those workpieces which pass the watchful eyes of the inspectors are hooked to a transfer conveyor, which moves them to the paint department which is located on the second floor.

An outstanding feature of the operation represented by the garnish molding department is the provision for ample banks of workpieces, so that the equipment and operations may keep going without interruption. This feature has been incorporated in the materials handling system by making each monorail sufficiently long to accommodate the bank material in addition to work in process. An example of this is seen in the transfer conveyor, which has room for a bank of 5,000 pieces between the fabrication and the finishing departments.

Another important feature is the centralized polishing wheel department that has been established, where the wheels used in the plant are set up according to the needs of each operation. Incidentally, this department is served by an experimental laboratory whose function it is to

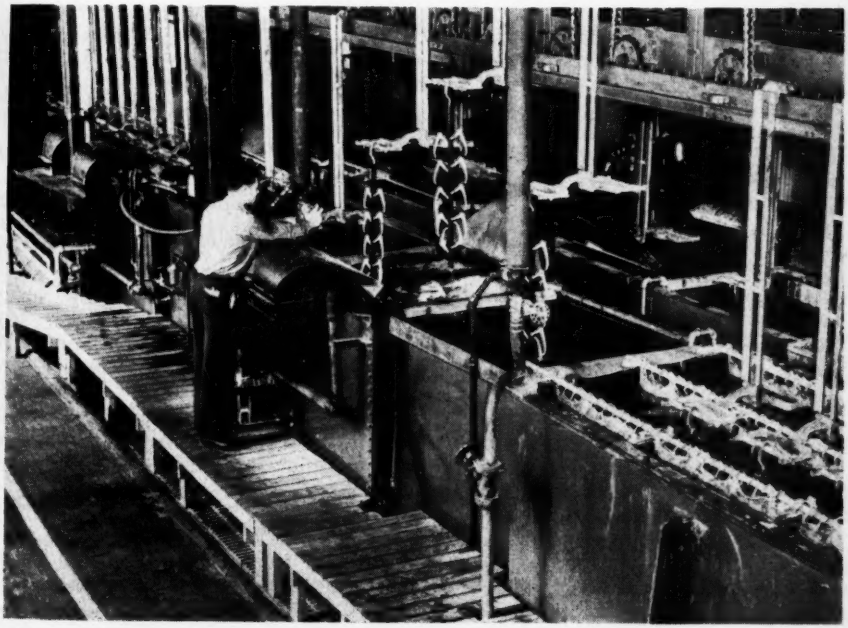


Fig. 2—View of the nickel plating machine which is more than 100 ft. in length. The conveyor carries the racked parts into and out of the complete series of baths.

Fig. 3—Beautiful wood graining effects are produced by the workers shown in this illustration. The two cleaning rooms provided for this purpose are completely air-conditioned.

carry on a continuous experimental program for the improvement of polishing wheel, polishing materials, and polishing procedure.

A department designated as No. 3 is the paint finishing department. This department occupies nearly 60 per cent of the gallery floor extending the length of the new building over the warehouse and shipping room. There are three separate paint lines in this department serviced by means of a unified system of overhead monorail conveyors that bring the work within easy reach of the operators and at the most convenient level.

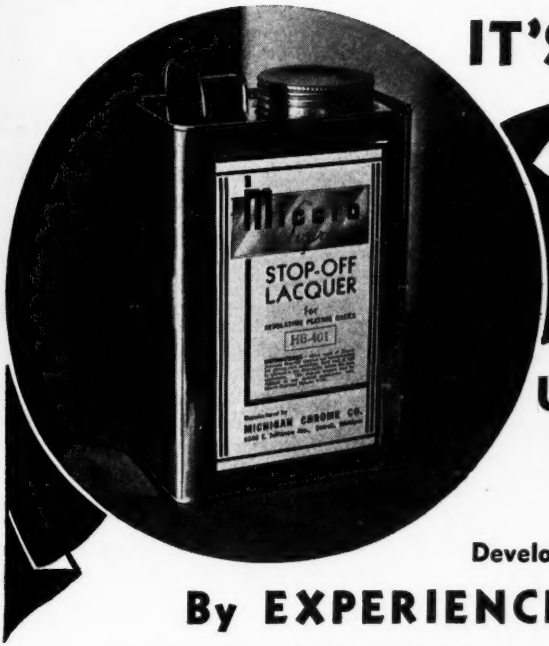
The beautiful wood graining effect that is part of the Fisher Body interior treatment is produced in two separate g r a i n i n g rooms, each of which is approximately 40 ft. square. These rooms are air-conditioned to aid in achieving the most perfect finishes possible. In addition, the entire finishing department is provided with a system of clean, filtered air to aid in the elimination of defects engendered by dust, dirt or moisture.

In the interest of worker comfort, as well as in the maintenance of the strict standards that have been set for the quality of the product, all paint spraying operations are done in modern water-wash booths which are supplied with filtered air.

Uniformity of the final finish is assured by the installation of a central paint storage and paint mixing room which is located approximately 300 ft. from the spray booths. In the paint storage and paint mixing room, the various colors are mixed and maintained under unvarying conditions. From here, the lacquer is piped to each of the spray booths by means of a recirculating delivery system.

The graining done at the Ternstedt plant is a proprietary process that has been developed to an advanced state over a period of years. The control exercised to assure the quality of grain finishes is apparent since a department is provided in the shop for making the gelatin rolls used in the process. This particular department, in turn, is served by a laboratory, which is constantly experimenting with improvements in rolls and in graining effects.

All window garnish moldings prior to finishing are cleaned to remove all traces of oil and dirt by treatment



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MICCRO Supreme Stop-Off Lacquers—furnished in either red or black—are not only the newest, but are, by every comparison, the most economical and practical materials ever offered for insulating plating racks for decorative plating or for masking parts to be hard chromium plated. They are applied *directly on the metal surface* with no treatment necessary other than a thorough cleaning of the surface to be coated. Once applied, they provide a perfectly uniform coating that can be depended upon to give exceptional insulating service—withstanding many of the most severe tests to which plating racks or masked parts may be subjected.

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Micero Supreme Stop-Off Lacquers have proved to be practically unaffected through the regular cycle of decorative plating. Tests with alkaline cleaner at 212 degrees F. showed the coating still effective after 500 hours of continuous immersion. Additional tests proved the coatings to be unaffected by concentrated or diluted hydrochloric or sulphuric acid, cyanide or acid copper solutions, standard or bright nickel and chromic acid baths. They can be used with degreasing units. These lacquers dry rapidly in air. When used for masking parts, sharp clean edges can always be secured. Other uses are for tank coatings, insulating bus-bars to prevent corrosion, protecting ventilating systems, and preventing sweating or rusting of water lines.

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in a chemical solvent cleaning tank. These workpieces are then dipped in a ground coat, allowed to drain, and are baked for 30 minutes in an oven. The frames then enter the graining department where the graining rolls are used to fix the pattern on the panel, faces, and edges. The next operation is known as "smoke" or shading spray coat which is used on certain portions of the frame. This is followed by a 20 minute bake to set the graining.

Throughout these steps, the frames are carried by a monorail system which then takes them into a lacquer spray booth and then to the drying ovens. The final lacquer coats are set by baking in the ovens for a period of 30 minutes.

Parts such as reflectors, windshield division moldings, interior escutcheons, switch plates, dome light elements, and so on, that are to be plated are fitted onto racks which are placed on a monorail conveyor which carries them into the polishing department. Operators at a battery of eight semi-automatic polishing machines unrack the frames, complete the polishing operations, replace the part on the racks, and hook them to the monorail which moves on to the degreasing machine.

The degreasing machine prepares the parts for the electroplating operation by removing any foreign matter that may have accumulated on them during fabrication. The degreased parts are then hooked on the conveyor of the nickel plating machine, which carries them through the various stages of preparation and immersion in the nickel bath through an automatic cycle. The time required for the nickel plating operation is 90 minutes. This length of time is required in order to meet the G. M. specifications for a total plate of 0.001 in. thickness.

After nickel plating, the workpieces are unracked and transferred to a storage monorail. This monorail feeds the parts to a line comprising a battery of 10 buffing machines on which the workpieces are given what is called a nickel "color" by hand. Following another inspection, the parts are again racked and hooked to the automatic conveyor which conveys them to the chromium plating department.

The corrosion-resistant chromium plate is applied in a new automatic chromium plating machine which is 56 ft. in length. Both the nickel and chromium plating units handle the workpieces by means of special automatic conveyors, which dip and rise as they move from one solution to another.

Many small parts which are rather difficult to polish automatically, yet are required to exhibit the same finish and eye appeal as the larger items are subjected to a separate finishing operation. For this purpose, the Ternstedt engineers have devised a series of tumbling and burnishing machines that produce a beautiful finish. A battery of 13 tumbling barrels, in which the parts are cut down, is provided for this purpose. This takes the place of polishing, while a battery of eight double-burnishing units aids in producing the required finish on them. Small stainless steel, nickel or chromium plated parts are handled in this manner. Following these operations, the small parts are put through a battery of three continuous and automatic units, which wash the parts and dry them with sawdust.

The finishing of zinc die castings is another interesting operation, since these parts consist of deck lid and trunk handles, trunk hinges, crank handles for window regulators and ventilators, and door handles. The first in the series of finishing operations of the zinc die castings consists of polishing. This is followed by

buffing, an operation performed on a buffing machine which is equipped with heads that are said to seek out and finish every face, corner, and crevice. The polishing machine is 64 ft. in length and has 10 heads which are located in such a manner as to polish every part of the workpiece.

Following the polishing operations, the zinc die cast parts are transported by monorail to an automatic chemical degreasing machine that removes all traces of dust, dirt, grease and polishing compound. The individual parts are then placed on plating racks, and are moved on to the automatic nickel plating machine. This is a self-contained piece of equipment more than 100 ft. in length, which contains a complete series of baths, including the electroplating solution. Following the nickel plating operation, the parts are chromium plated.

All the chromium plating is handled by one machine, centrally located and connected by monorail to various inspection stations serving nickel plating operations. The chromium plating machine is fully automatic in action and is 54 ft. in length.

After chromium plating, the parts are removed from the plating racks at the striping station, where a decorative striping is applied by hand. Leaving the striping station, the parts are conveyed through a baking oven in which the lacquer permanently sets.

Despite the fact that interior fittings in an automobile body are not exposed to the weather, those produced at the Ternstedt plant are treated in exactly the same manner

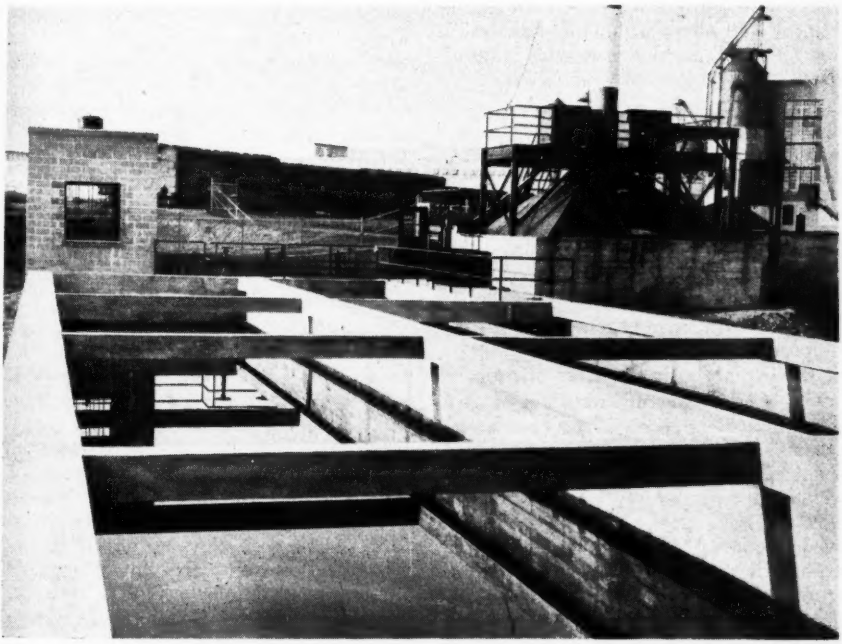

Fig. 4—A view showing the acid neutralizing plant constructed within the confines of the new Ternstedt plant. It is here that the waste material from the plating tanks is rendered harmless before being passed into the sewage system.

as the exterior parts, in that they are given the same protective coatings. To expedite the production process, some of the interior hardware operations are performed on different pieces of equipment. As an example of this, the interior hardware has its own polishing equipment, including two special straight-line automatic polishing machines.

All unexposed parts, such as cowl ventilators, window regulators, and cowl vent handles, are finished with a coating of black enamel and are run through a huge overhead enameling oven 100 ft. long, that is served by a monorail conveyor, 1,031 ft. in length. Such items as bumper caps, door check link assemblies, cowl ventilator cover assemblies and door lock strikers, on the other hand, go through a bonderizing treatment combined with a ground coating, the final finish being given them at the Fisher Body and General Motors assembly plants to which they are shipped.

The first operation prior to enameling is a wash in a caustic soda solution followed by a hot rinse to remove all traces of dirt, chips and oil. The parts then cool while traveling on the monorail, dip into the enamel, pass over a series of drip tanks, and double-pass through the drying oven. The monorail then takes them down to floor level, where they feed into hoppers and proceed by gravity feed to the central distributing station.

The bonderizing unit is of the spray type. Parts to receive this treatment are deposited on racks holding approximately 40 pieces, the exact number depending upon the size of the parts. These are hung on an overhead monorail for bonderizing, after which they are hand-dipped in the ground coat. The racks are then returned to the monorail for the trip through the drying oven, moving from there to the central packing station. This oven is approximately 150 ft. in length, and, like that used for the enameling operation, is suspended at truss level, or about 14 ft. above the floor. The monorail serving as the ground coat and bonderizing feed conveyor is 1,125 ft. in length.

The second section in the mechanical hardware department occupies two bays, each 40x425 ft., and is devoted to the production of deck compartment, door and remote control locks. Zinc-coated strip stock is used in the manufacture of all parts where no welds are required; others are zinc-plated upon completion of the fabricating operations to prevent the possibility of corrosion.

The parts to be zinc plated are treated in an automatic barrel-type plating unit, approximately 60 ft. long and 9 ft. wide. The various parts are loaded in rubber coated baskets on a return-type conveyor that automatically raises and lowers them as they move through the various baths. While in motion, the baskets are rotated to insure the proper treatment of all parts, which are automatically dumped out of the baskets on an inclined belt conveyor upon completion of the cycle of baths in the plating process. The conveyor carries the various parts to portable hoppers, which are used to transport them to the assembly stations.

One of the most interesting features of the new Ternstedt plant is the manner in which the waste material from the giant plating tanks is handled. Three problems face the engineers and chemists charged with the responsibility of developing a suitable means of neutralizing the acid wastes of the finishing departments. The first problem is that of handling the 1,500,000 gallons that is discharged by the plant each day.

Though cyanides, nickel sulphuric acid and other toxic chemicals are sure to be present, this mixture did not present such a difficult problem.

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Recent developments in plating processes have reduced the amount of cyanide required to a minimum. Coupled with this is the fact that the solution is one consisting largely of water, coming principally from the washes that are given the chromium plated fittings and other parts as they progress through the various stages of manufacture. The second problem had to do with waste accumulating over the weekend due to cleaning of the tanks. In this period, when the plant is not in operation, the solutions are drained into reservoirs provided for the purpose and the tanks can be thoroughly cleaned. The resulting waste, as might be expected, is more highly concentrated in that it contains a higher percentage of solids.

The third problem was the question of disposing of the actual solutions in the tanks when they lose their usefulness, a thing that may occur as often as once a month or only two or three times a year. Nickel solutions are neutralized by the addition of soda ash, but sulphuric acid, the agent required to render copper cyanide harmless, generates cyanogen when the two are brought together. In concentrated form, this is a lethal gas.

In the final analysis, it was decided to construct two 175,000 gallon tanks, 500 ft. from the factory building, to condition the daily and weekend waste. The daily waste passes through one of the 18x120 ft. tanks at the rate of 150,000 gallons an hour. The mixture is tested by a chemist on duty there, who determines the treatment required, adding whatever chemicals may be necessary to neutralize the waste and precipitate the solids.

The treatment requires approximately one hour. The harmless liquid remaining at the end of this time passes through a metering device and into the city sewers, while the sludge accumulating at the bottom of the tank is pumped out and buried on the property.

Treatment of the weekend waste in the other 175,000 gallon tank is similar to that given the daily waste, though the process necessarily must be slower, the actual rate being determined by the quantity of chemicals found in the solution.

An enclosed, glass-lined tank of 13,500 gallon capacity is employed in converting the large dumpings of nickel and copper cyanides that may occur occasionally into harmless effluents. This process requires three days. Provision is made for reclaiming both the nickel and copper, it might be added, after this treatment.

The principle feature of this tank is the complete control that is exercised over the cyanogen gas generated by the addition of sulphuric acid to the copper cyanide solution. Cyanogen becomes innocuous when diluted with sufficient quantities of air, and this is the system adopted to render it harmless.

"Hoffman Heavy-Duty Portable Cleaners." This is the title of an 8-page catalog describing the four sizes of Hoffman Portable Vacuum Cleaning units now being issued by United States Hoffman Machinery Corporation, Air Appliance Division, 105 Fourth Ave., New York, New York. This catalog explains in detail how dust can be removed rapidly, thoroughly and economically from finishing departments with Hoffman Vacuum Cleaning equipment. The four sizes of Hoffman Portable Vacuum Cleaning units are designed to meet widely varying needs. Each of the four units is thoroughly illustrated and described. Diagrams are used to show the operating mechanisms and also the structural details of each unit.

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Bright Nickel Ricochets

The word "ricochet" seems to the author to define the manner in which the bright nickel problem is being shuttled back forth. In this article, he suggests some questions to which the industry would like to have answers.

By FREDERICK FULFORTH

Finishing Supervisor, The Proctor Electric Co., Philadelphia, Pa.

MANY manufacturers and jobbing shops are now engaged in bright nickel plating with varying degrees of success.

Others have tried one or more solutions unsuccessfully (to them) and are still continuing to try, try again while their competitors have discarded the last trial to install the first failure of the other fellow. So it goes. As for the wary individu- also who want to float on the top of the wave (after others have done the battling in the troughs to get them all up on top) they are now afraid of getting wet with the heavy splashes of their competitors' falls into bright nickel plating, since they say, "Suppose he makes a swimming success of it and takes all our business at a cheaper figure and we stay out until our customers and sales outlets have been weaned from us. Then we will have years of hard work to get them back and be unable to better their costs in the end."

Frederick Fulforth

Or perhaps they say, "We are afraid (we hope) that our business rival is going to lose a lot of money in bright nickel, while it is possible, by his failure to make deliveries and meet specifications, that much of that business will be lost to him (trust we find it)."

Now from any angle, if all dive into bright nickel of the same type, all swim together, since the onus of making the thing work is equally on the seller thereof—but if we buy different processes from various patent holders or claimants where do we stand? No one knows. *But someone should know. Our technical organizations have missed a golden opportunity for the past five years to test, determine the workable solutions and recommend them as such, to their membership, in a purely disinterested manner. It is to be hoped that in the near future some such service may be started.*

From keeping open ears and being nastily inquisitive, it appears possible to resolve the situation somewhat

in this manner:

A. It would seem that bright nickel is here to stay because:——

1. For certain cheap classes of finish it has already proved itself and this statement can be verified by its users. Also for some high-class expensive work where thin coatings, particularly on brass, are called for, or on articles hard to buff without cutting thru the nickel on high ridges and as a decoration. Plenty of these may be shown as desirable examples, or even an exceptional heavy deposit.
2. Its ability to use high current densities cuts the plating time so that were it a consistent performer of good deeds only, there could be no question in anyone's mind as to its economy.
3. Even where some buffing is required its superiority may be proved since:

(a) Less buffing is required to attain the same lustre, because a brighter color in some degree is present to begin with and no effort need be expended to secure that alone.

(b) The recent improvements have brought all the proprietary solutions studied to a fair degree of ductility, making possible rapid and economical buffing to cover surface defects and polishing marks.

In this connection, one class of high finish chrome plated work, completed without any polishing, was found to buff between one-quarter and one-third of the cost of gray nickel, while the same class of work polished with a 180 grease wheel was buffed so closely below the cost of gray nickel buffing that there was no appreciable difference. This latter represents the worst case studied and shows nothing detrimental to the application of bright nickel in itself.

4. Whether buffed on the outside or not, the insides are incomparably more attractive in sales appeal with their high lustre, free from the inevitable finger-marking of the gray nickel.
5. Again the later improvements in solutions obviate the necessity for reactivating before chrome plating, and in fact it seems that a better and more certain chrome-throwing power is provided than on buffed gray nickel.
6. In spite of the numerous work stoppages in the recent past, experienced by almost all bright nickel users, their frequency is diminishing and their duration lessening so that it is always possible to see smaller and smaller monetary losses with each one, until the law of diminishing returns (or something) brings shutdowns to a vanishing point; just as those for chromium solutions have for some time past been so far beyond said vanishing point that it is doubtful if the Mount Wilson Observatory could find them with its largest telescope, although as short a time as five years ago many chrome users were debating the advisability of its continuance as against a return to nickel finishes.

In this connection, one large operator informs that he had only an 8 percent loss in six months of bright nickel operation using one solution all the time and since in the first few weeks it became absolutely inoperative and the losses were 100 percent, it is evident and encouraging that he is on the right track to make up his original deficits and eventually show a profit, more particularly so as he has almost

learned what not to do. He still loses some business, however, due to the fact that in changing from one class of work to another, trouble is usually experienced and the proprietors of the solution invariably have to be called upon to readjust its constituents, so that if the job is on a rush basis the purchaser becomes disgusted with the delay and either goes elsewhere the next time or fails to specify bright nickel with his following order, being afraid of delayed delivery.

7. Those using a poor quality base metal with perhaps heavy acid copper coatings buffed before nickel plating, need not expect to apply bright nickel direct and obtain the same trouble-free finish, as the best base procurable is none too good for any plated coating, while this axiom is embellished by the use of bright nickel.

8. The additional metal constituents used as brighteners in some baths do not lend themselves to increasing corrosion resistance, it is claimed, so that more testing is required to prove or disprove this theory.

B. After re-reading the last few optimistic paragraphs, one may be tempted into sending a night letter order for a solution, but before doing so, a glimpse at the other side of the picture is desirable:—

1. In the first place, consider the average twenty foot long semi-automatic nickel plating tank as a practical standard for previously known plating solutions where no big scale automatic production is required.

   The average load placed in such a tank would closely approximate 150 square feet of plating area which, at 15 to 20 amperes to the square foot, would require a 2500 to 3000 ampere generator; but now it is proposed to plate at 40 to 50 amperes per square foot minimum, which means at least a 7500 ampere generator and after that is installed, will the tank connections carry the higher amperage, and if so, will the present racking equipment do? And what kind of lining has the tank? And what of a properly lined spare tank for decanting and filtering through activated carbon with filter aids?

2. Moreover, with a narrow temperature range, is it desirable to lay out hard cash for an automatic temperature control, another $150.00 (more or less) for a quinhydrone PH set, a further investment of nearly $200.00 in an ampere hour meter to control brightener additions and a small additional purchase of a stalagometer, to say nothing of someone sufficiently skilled to use this apparatus without ruining it irretrievably and its owners financially?

   Of course, none of these things is absolutely essential to bright nickel operation—but try and get along efficiently without some of them.

3. Or from another slant, if the previous conditions are all fulfilled, how about the retention of the former cleaning cycle against capacity increases, necessity for much better cleaning than before and the old bug-a-boo of the base metal in previous operations as compared to the new departure? And some other things about which nothing is known.

4. Moreover, rejects become quite a factor. The outside of most work is easily stripped and refinished after blistering or peeling, but the unpolishable inside areas, if

in evidence, now have no dull gray nickel to cover the pitting caused by stripping and will have to be scrapped, since their appearance under bright nickel creates sales resistance with the first glance. Here is a chance to prove some of those non-attacking strips everyone has heard about but never seen.

Some of this may be cared for in design, but the time to consider the changes necessary is previous to bright nickel installation, not after thousands of rejected pieces are rusting into oblivion.

5. Service will be required, unquestionably, so that the problem of who is nearest and best equipped to give it—everything else regarding the solutions being assumed equal—should be considered; or whether self-service is possible, by simple analytical tests for bath constituents and purity of chemicals required as additions.
6. The use of cyanide copper flashing previous to bright nickel plating is generally recommended but so far as can be learned, only as an additional aid to discovery of faulty cleaning and some sellers admit its optional use for this purpose, but nevertheless, it must be considered when contemplating an installation as the present cleaning cycle is an unknown factor when applied to bright nickel.

So much for pro and con discussion as heard from time to time without an attempt to prove or disprove any of the theories, but it is hoped a clearer picture of the problem may be presented for the smaller investors' consideration; and after all it is the little fellow who is most interested, since he has no research department of his own to tell him what to do and is frequently not even in a position to go out and check the truth or falsity of statements made to him.

What is the industry, as such, going to do about putting him on the right track, or is he to be left to his own selection, failing expert council, and depend entirely on the integrity of his source of supply?

This latter were probably the best thing to do, but when one considers the moral obligation (if nothing more) to buy anodes and supplies from his bright nickel source, will all suppliers be their brother's keeper, and for how long?

One thing stands out very clearly, and that is the imperative necessity for close production control. To bright nickel plate thousands of pieces without continuing through the succeeding finishing operations (particularly so if chromium is applied) and testing for adherence, appearance, ability to withstand heat or cold, moisture or artificial ageing, then to discover 80 percent rejects, would be ruinous — but the manner of conducting some observed shops today would closely approximate just such conditions.

Moreover, a greatly improved procedure over present day methods should be considered with any new layout and sufficient space allowed to consummate unforeseen additions. As an example, it may be entirely possible in the near future with better finished raw stock, especially steel, stabilized brighteners and methods of bright nickel operation, to entirely eliminate nickel buffing for even the best class of finish and if this can be done, sufficient floor space should be left available to arrange for continuous plating of chromium on nickel by the use of one racking (again provided a rack covering can be found equally impervious to solvent, vapor, alkaline and acid cleaning). But if the chrome tank is one or more floors distant and no space available close to the nickel equipment, this possibility is lost.

Even though such space be available with all accessories provided, the rack design should now be made to conform in type for cleaning, nickel and chromium plating, rather than continue to rerack after the elimination of buffing; or to scrap both nickel and chromium plating racks and adopt a universal design later.

Or, worse yet, to have a universal rack which will be too long for one tank, but short for another, necessitating the purchase of all tanks of equal depth which, if they are lined in any way, can run into rather nice figures.

It may be said that the foregoing is only common sense and self-evident truth, but in extenuation of its inclusion, examine the racks and tanks in any two or three plating plants and be honest in conclusions drawn therefrom, irrespective of the reasons given by their operators for the variation certain to be found.

In conclusion, it is believed axiomatic — there is no room for variance in opinion that the use of bright nickel plating will eventually, appreciably lower the cost of nickel plating by any present known method, but the final attainment of this desirable achievement is believed discoverable in the answers to some of the questions propounded above and in complex ones, which will inevitably follow these of comparatively simple solution.

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Crystallizing Lacquers for Metal Products

Various novel effects impart new appeal to modern articles.

By Frank V. Faulhaber

MANY metal-finishing plants amply prepared to undertake a great variety of work nevertheless for some reason hesitate to produce crystallizing lacquer finishes. One foreman contended it was too much uncertainty and trouble and the effects are not always as desired. One peculiarity, admittedly, of crystal lacquer finishes is that the various kinds of these lacquers do not produce identical results. That, however, lends interest and fascination to this work.

When variety is sought, then a crystallizing lacquer is desired that breaks into various effects, each appealing in itself. Certain of the crystal lacquers simply develop a maze of radiating lines; with others can be achieved spreaded areas of delicate, feathery patterns almost throughout the work. Some of the crystallizing lacquers are so elegant and superb in their completed effect resembling needle-like patterns, winding lines, the most daintiest and weirdest of finishes. Sometimes flowers, ferns, and thin, wisp-like executions are variously interweaved in the completed effects.

With this type of finish it is essential to exercise more care in the matter of drafts, dust, than with other finishes. Humidity, atmosphere, uniformity in heating, the method of application all are important factors. The beginner with crystallizing lacquers should not become too quickly discouraged. Experiment upon experiment may be necessary until finally the desired effect will be obtained. A good plan is to try out these finishes on different panels, produced under different atmospheric and other operating conditions. Results will oftentimes be revelatory. The finisher will know what most effective procedures to apply for his particular purposes, also what to avoid.

Crystal effects can be produced on various materials, but, so far as metal products are concerned, this type of work can be seen on radio containers, lamps, office machines including typewriters, adding machines and so on; caskets, household appliances and a great range of divers novelties. Dazzling and bizarre effects are produced on lighting fixtures, done on a scale now where it is no longer a novelty. Of course, these manufacturers did not obtain immediate results as sought, but with all their success there is much experimenting yet being done to achieve still other unusual effects.

Sometimes the finisher may be disappointed because the crystal effects are not uniform. This may be due to uneven heating in the oven. Obviously, the more uniform the heating, the more uniform the ultimate results. The baking ovens must be looked after before undertaking the spraying of the work. The oven must be properly warmed, keeping the temperature

ranging from 125 degrees Fahrenheit to 140 degrees. The door may be kept slightly open, just so long as no draft enters. Immediately upon spraying, the work should be set in the oven. The finish will crystallize usually in 15 to 30 minutes, following which the drafts can be opened, then permitting the finish to bake until dry.

Crystallizing lacquers are available clear, colored with dye solutions or pigmented. The pigmented type may be had in any color or pastel shade and ensure various crystal effects. Of the pigmented kinds, the long needle type affords beautiful effects, pigmented, and this crystal finish gives one an idea of the remarkable contrast possible. Being of a single color, in this lacquer, the needle-like effect diffuses the light rays, thus bringing out a pronounced contrast. Among finishers, today, this particular crystal finish is proving markedly popular, for it has wide use.

There are also one-color crystallizing lacquers in which dye solutions are added. To produce larger crystals many of these lacquers are made up so that they will dry slowly. Various wondrous effects can be executed by spraying or pouring certain areas of the work in one color and filling up the open parts in another color. Skillfully manipulated, there will be no noticeable break in the crystallization between the different colors. The needles work right through, from one color to another. The adept finisher can also bring out a nice blend in the dyes of the two lacquers, different shades being possible.

The crystallizing lacquers can also be dipped or poured; there are even some operators who favor brush applications. There are many pros and cons in this matter of crystal finishes, each method having its proponents, and each system, of course, has its particular merits. More and more,

however, spraying seems the preferred method of application. For a simple black crystal, one-coat finish, the clear lacquer can be sprayed under an air pressure of from 20 to 40 lbs. However, here again there is a variety of opinion as to the proper air pressure to use. Some finishers favor 50 to 60 lbs., particularly with a heavy lacquer, in order to obtain the right atomization.

Each plant will naturally have its individual conditions and problems to cope with, and these must be borne in mind. Hence, the finishing department cannot experiment too much to fit proper methods with its facilities, so as to obtain desired results. When striving for unique effects and especially large crystals, some finishers spray as wet a coat as possible, under a low pressure, avoiding as much as possible the overspray. Some finishers claim a more uniform film can be applied under a low pressure spray, and that there is less evaporation of the solvent before striking the article under finish. In any case, uniformity of finish should always be the aim, and, of course, this applies to the coat of finish and also its drying.

When a two-coat crystal lacquer is applied, the identical course is followed as for one-coat work, except that a ground coat of plain black baking enamel is sprayed on, and baking before laying on the crystal lacquer. The first coat here being actually a primer more certain to obviate dull spotting due to porosity, roughness or pitted character of the metal, the ultimate results are the more satisfactory and positive. Black or clear crystal may be sprayed for the second application. Some finishers dislike the clear because of the greenish cast of varnish sometimes noticeable, and for that reason prefer the black.

In the matter of consistency of the lacquer, here, too, there is wide range of preference, some finishers stating the wetter the application the larger the crystals, while other finishers seem to get larger crystals with a heavier lacquer. However, it is not the body of the lacquer alone which is the main factor; each finisher seems to have a pet technique to which he adheres. So long as he produces the correct effects, for which the individual plant aims, the particular method in force matters little.

When trying to bring out a colored crystal effect, a ground coat is first spread on, of the desired color, then overlaying with a clear crystal lacquer. When additional figures are to be worked in, or decorations of any kind, such as decalcomania, striping, letters, and so forth, the better procedure is to get this in before spraying on the clear crystal lacquer. Thus also better finish and durability is obtained for these artistic details.

A nice contrast is obtainable when a feather clear lacquer is applied over black, and a beautiful finish akin to pearl is brought out when applied over white. In all the vast range of colors a practically unlimited variety of effects can be produced, depending considerably on the individual finisher's talents and experimentation. In one shop, the department foreman extends the widest leeway to its finishers, each operator noted for beauteous execution of crystal finishes peculiar to himself, and himself alone. One foreman even went so far he could practically tell by looking at a finish of unusual design just which finisher was responsible. And assuredly this is not an impossibility.

The shop just starting to put out crystal finishes on metal products can accomplish considerably when at least one of the finishers visit one plant or more, noted for successful finishes in this line. Thus can be observed just how others are doing this work, and whatever time and other expense is applied will be amply repaid by suc-

ceeding improved results. Each shop has different methods, different ideas, and different finishers. An interchange of experience and opinions will prove valuable and timely. Additionally, the manufacturer can obtain helpful instruction from the various representatives putting out the crystal lacquers.

Particularly for crystal lacquer finishes the field of work should be as clean as possible, and any adverse interference such as weather is likely to affect the ultimate result. So far as possible, these lacquers should not be thinned, paying heed to manufacturers' instructions regarding use.

Metal Coloring and Finishing

The 1938 authorized translation of the second German edition entitled "Metal Coloring and Finishing" by Hugo Krause, consulting chemist in the metal-finishing industry, is now off the press. This book tells how to color all types of metals and alloys, how to prepare metal surfaces for coloring and how to finish colored metals.

The volume discusses from the theoretical, practical applications and patent angles the subject of metal coloring by chemical, mechanical and electrical methods, the latter being sub-divided into cathodic and anodic procedures. The author attempts to relate all the important methods applied to iron and steel and the base and noble metals, in their sheet, cast, mechanically fabricated, or electroplated forms.

"Metal Coloring and Finishing" is comprehensive and will be of particular use as a reference and guide book to those engaged in metal coloring in its decorative as well as protective phases. Many of the so-called secret processes of the electroplating are described in detail with critical comments by the author.

The contents include Formulae and patents; Influence of alloying on coloring; Difficulties encountered; Preparation of Surfaces; Degreasing; Rust Removal; Grinding; Polishing; Cleaning; Lacquering; Waxing; Electrochemical Methods, Dipping, Rubbing and Contacting Methods; Nickel; Copper; Brass; Zinc; Tin; Silver; Gold; Platinum Plating; Precipitating Antimony; Arsenic and Bismuth; Cathode Treatments; Anodic Metal Coloring and Protective Coats; Green Plating; Chemical Metal Coloring; Tempering; Burnishing; Phosphatizing Rust Prevention; Coloring and Protecting Iron, Copper, Gold, Silver, Zinc, Brass, Bronze, Cadmium, Tin, German Silver, Aluminum, Magnesium, Metal Lacquers, Varnishes; Bronze Powders; Antiquing Imitation Platinum Finsh; Bibliography.

Copies of "Metal Coloring and Finishing" can be obtained by writing to Chemical Publishing Co. of N. Y., Inc., 148 Lafayette St., New York, N. Y., and remitting five dollars per copy.

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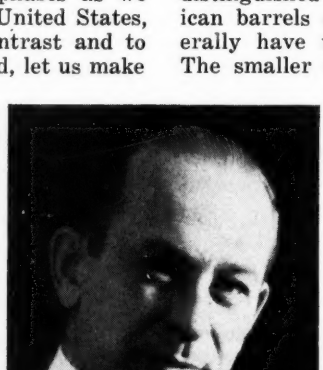
Barrel Finishing of Metal Products

A Resume of the English Conception of the Barrel Finishing Process.

By H. Leroy Beaver

IN all of the preceding papers in this series we have dealt with the subject in its various phases as we find it practiced in the United States, and now by way of contrast and to illustrate methods abroad, let us make an imaginary visit to one of our good neighbors, and so we journey to England to visit what we might term an average manufacturing establishment producing parts of various kinds fabricated from steel and brass and variously nickel, copper and cadmium plated.



H. Leroy Beaver

Inasmuch as what we know and term as the "long and narrow" type of burnishing barrel was first commercially adopted in England as represented by the Edmonds barrel, it is interesting to note that neither the Edmonds type nor the later "high and narrow" type of Abbott are used in this establishment where the burnishing equipment consists solely of twelve barrels all of the oblique tilting eight of which are of cast iron shell with ten sided paneling and four of oak also of ten sided paneling, as distinguished from the average American barrels of this type which generally have twelve to sixteen sides. The smaller barrels are 24 in. deep with 18 in. mouth and the larger types 30 in. deep with 2 foot mouths, and all of these barrels whether used for cutting down or burnishing are operated at the same uniform speed of 50 r.p.m.

Prior to the publication of this series of papers they used ¼ in. steel balls as their burnishing material, but now they have incorporated into their burnishing mass $\frac{1}{16}$ in. x ½ in. taper steel pins; a part which they manufacture in their own plant and which they call "stars" which are a six pointed metal piece of $\frac{1}{16}$ in. thickness, diagonals, ovalbals and another "kidney" shaped piece which they also manufacture. At times and on certain classes of work they have also used a burnishing piece ¼ in. in diameter

and 1 in. long which they term "bits", and their last addition to the burnishing material was ¼ in. Finbals.

In preparing their burnishing soap solution, their practice differs materially from our procedure for in the barrel we have before designated as the "small" size they use 6 Imperial gallons of water and in the "large" barrel 12 Imperial gallons of water. In our procedure we would use only 1¼ and 3 gallons respectively. The hardness determination of their water supply shows a permanent reading of 8.9 grains hard due to presence of $CaCO_3$. In forming their soap solution they use a well known make of English soap flakes with a titer of 29 which might indicate that the soap is of vegetable oil base rather than a hard tallow base such as is principally used in the United States and whose titer would normally be from 40 to 42.

Soap solution is used in the wood barrels only. For brass parts which they burnish for from one to two hours per load, they use two to three equal lots of soap each one pound in weight which are added during the period of burnishing. For steel parts which have a burnishing time of from two to five hours, depending on the nature of the parts, the amount of soap used is also two to three pounds, which is also added in one pound lots during the burnishing period.

Before the publication of this series their practice was to stir one pound of soap flakes into two gallons of water and stir this until a lather formed and this mixture was then placed in the empty barrel, following which two gallons additional of hot water was added. Their practice has now been changed and their present method is to make up a stock soap solution of ten pounds of soap to 40 gallons of water. This mixture is then used as required, two gallons of the solution being put into the empty barrel, always followed by two gallons of hot water. Using this soap solution the average operating cycle is one to two hours on brass and two to five hours on steel parts. On nickel and cadmium plated parts the average operating time per barrel load is fifteen minutes.

On copper plated work the procedure is first to barrel burnish same as the preliminary preparation for nickel and this is followed by another barrel burnishing operation after copper plating. On brass parts, the procedure is to bright dip prior to barrel burnishing and in this operation a double dip is used as follows:

(a) Old Aqua Fortis
(b) Aqua Fortis ..... 16 parts
Oil of Vitriol ..... 8 parts
Hot Water ..... 1 part

In the burnishing process where steel parts are in work the procedure is as follows: If scale is present, it is removed by immersion in a cold still 10 percent sulfuric acid solution in a lead lined wood tank. The parts are then passed through two cold water "swills" and then placed either in a cast iron barrel or wood barrel for operation as experience has shown produced the best results on each particular part.

If a cast iron barrel is used the burnishing solution fluid is caustic soda 10 percent which after it has removed any grease initially present

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on the parts is changed and a fresh charge of the caustic soda solution is then added and the barrel rotated continuously until the operation is deemed satisfactory and complete. The strength of the caustic soda solution is always maintained at approximately 10 percent. At the end of this operation the barrels are tilted and the caustic soda solution poured off when the parts, along with the burnishing material used in the operation are packed into perforated iron colanders each of two gallons capacity. At this stage of operation and in this condition, that is, without being swilled, the parts are ready for the plating process which is carried out as follows:

1. Passed through two cold water swills.[1]
2. Pickle for about one minute in 10 percent sulfuric acid pickle.
3. Swilled through two cold water swills.
4. Transferred to plating barrel.

The above procedure is used whether the work is to be copper plated (cyanide) or nickle plated. If a wood barrel is used the work is soap burnished.

After the barrel burnishing operation the soap mixture is discarded and the work and burnishing material is then poured into the iron colanders previously described, each full colander being then swilled with four gallons of hot water. The burnished parts and burnishing material are then dried out in hot sawdust in a gas heated revolving oblique tilting type sawdust barrel. The work is now ready for plating, after going through four operations just heretofore described.

After plating, the work is thoroughly swilled in cold water and then again dried out in the oblique tilting type gas fired sawdust barrels, the burnishing material at this stage being riddled out or separated from the parts. The burnishing material after being sorted is stored in dry bins until it is required for another burnishing-plating cycle. **It should therefore be noted that the burnishing material is alternately burnished and plated and is not separated from the work before the plating process.**[2]

New burnishing material before placing in work receives a pre-treatment of acid pickling in 10 percent sulfuric acid solution followed by a caustic soda solution barreling as described in the foregoing outline where the cast iron shells are used. No electrolytic cleaner or vapor degreasing process is used nor do they employ any patented or Trade Name cleaners.

Steel parts are burnished in cast iron barrels and wood barrels, brass parts in wood barrels only.

Small cast parts are processed in the same establishment as well as parts formed from strip or sheet steel, some of which are required to be annealed in some step of the forming process, and the method used for the removal of scale is as follows:

A. A red foundry sand is used which is saved after its initial use and then mixed with a small fresh sample of the sand so that the real sand used is a mixture of old and new red foundry sand.

B. A sharp silver sand mixed with oil is run with the parts in a cast iron barrel which is rotated from two to three days, this

(1) **Note: The operation which in England is termed "swilling", we suppose might be compared in terms with what we would call a "rinse", but the operation will be understood from the method in which it is performed. It is accomplished by pouring hot or cold water over the perforated colanders of work and not by immersion of the work in a cleaning solution tank of any kind.**

(2) **Note: This is our first experience in over twenty-eight years of burnishing research where we find burnishing material being plated along with the parts being processed.**

comprising the method for removal of sprues, gates, fins and so on.

C. After annealing, method B as described is used. If scale is present when the work is to be processed for burnishing or plating (even though it has been treated as in operation B) it is pickled in the 10 percent sulfuric acid solution and then barreled off in the 10 percent caustic soda solution.

After any of the above operations the parts are swilled and then dried out in the oblique tilting heated sawdust barrels as before outlined. The above procedure is also used for the removal of any die or tool marks that might be present on the parts.

Where parts are required to be cut down to any considerable extent the cast iron shell barrels are used. Generally the abrasive material and parts are operated alone but on some parts it is thought that the action is accelerated by the addition of the ¼ in. x 1 in. "bits". The operation is of course performed wet, the length of time varying, depending on the amount of scale to be removed or other defects in the work that are required to be eliminated. Pumice is the abrasive material used in this operation and in the proportion of three to four quarts of pumice by volume to each four to six gallons (Imperial) of water, and the standard load of parts for this operation is sixteen quarts. Following this cutting down operation the only further operation is to swill the parts with cold water after which they are transferred either to a wood or iron barrel for the soap burnishing operation.

Strip or sheet steel purchased for processing is specified to be "half hard". Some of the steel is coated with black magnetic oxide, and it is from these types of steel that all the various forms of stampings are fabricated.

In all of the acid pickling operations no inhibitor is used, nor is there any acid neutralizing solution used anywhere along the line of general procedure.

In all burnishing operations where soap is used the solution is maintained in a "creamy" lather state, and when the soap starts to break down, it is then that the additional quantities are added from time to time during the burnishing process.

On completion of the burnishing operation, the work as well as the burnishing material, for they are not separated until the final completion of all processing, are kept covered with

1. Caustic soda solution, or
2. Soap water solution.

If the protective solution is the first named and the parts are not required for further processing until

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the following day, both work and burnishing material are left covered with the caustic soda film. When required for plating, it then receives the 10 percent sulfuric acid treatment as well as the various swills as before described.

If method two is used and the work left standing in the soap solution, then the work and burnishing material are swilled with from four to eight gallons of hot water and dried in the gas heated sawdust barrels. **Burnishing material which is always plated with the work** is dried out also with the work, sorted and stored in dry bins until again required.

If through oversight or some other cause the burnishing material becomes rusty the treatment is

1. Pickle in 10 percent sulfuric acid
2. Barrel Burnish in 10 percent caustic soda solution until material is bright.

When burnishing materials are mentioned in connection with cast iron, this refers to burnishing forms which are also of cast iron and used in the 10 percent caustic soda solution operation. These are generally annealed before placing in service and then tumbled in 10 percent caustic soda solution until smooth.

This resume of typical barrel burnishing operations as conducted in England is solely for the purpose of giving American barrel operators an opportunity to note the contrast between the operations as described as carried on in England, and the same operations for identical purposes as they would be carried out in the United States.

Significant is the absence of the use of still tank, electrolytic or vapor degreasing methods and also the use of patented or Trade Name cleaning compounds, caustic soda seemingly being relied upon as an effective cleaning medium in all operations prior to plating. Apparently this method is very effective for the samples we were permitted to examine coming from these operations would compare very favorably with parts of like character as they would be processed in the United States.

It will be recalled that in previous papers we have stressed the fact that an operator should not use his burnishing barrel as a cleaning tank, but this referred to the closed type of barrels of the long and narrow and high and narrow types. It would seem that in the English practice these oblique tilting type tumblers are in reality a form of cleaning barrel, for the parts are given the 10 percent caustic soda treatment, and the solution changed from time to time as required until the load of parts is perfectly clean.

As we have said, the term "swilling" which is used in English practice, we have never heard used in connection with any metal finishing operations here. While it may have its disadvantages in some ways from an operating standpoint, we can see the merit in it when we contrast it with some of the rinsing operations we have seen in American plants. The colanders are supported and either hot or cold water or both are swilled over the parts which carries away all traces of sediment or scum through the perforations in the colanders, so that no scum from hard water or other soap residue is left on the surface of the parts, as we often find on dipping baskets of parts that gather top surface scum in the drag out operation from a rinse tank.

"Industrial Heating Equipment Engineering Data." This is the title of a 54-page catalog which is now being issued by Industrial Gas Engineering Company, Inc., 205 E. Ohio St., Chicago, Illinois. Thermo High Temperature Exhaust Units are illustrated and described. Specification tables, diagrams and operating charts are also included in this catalog. Copy free upon request.

Review of Third Annual Porcelain Enamel Institute Forum

THE Third Annual Porcelain Enamel Institute Forum, held October 12, 13, and 14 at the University of Illinois provided a large group of enamelers with three days of interesting papers, discussions, and personal contacts. The total registration of 355 included 9 enamelers from England, and others from Sweden, Poland, and Russia. Highlights of the various papers and discussions are here reviewed briefly.

Review of the Industry.—Emerson P. Poste. Scientific, technical, practical, and economic advances in the porcelain enameling industry during the past two years were outlined in order by Mr. Poste. Improved business activity, expansion of the field of porcelain enamel by increasing architectural applications, rapid plant modernization, and more accurate and scientific shop control have contributed to the recent advances of the industry. The current trend is toward increased use of acid-resisting enamels and unit-construction of stove and refrigerator bodies.

The Institute and the Plant Man.—Charles S. Pearce. The work of the Porcelain Enamel Institute through its Technical Committee was reviewed. Through its Market Research and Sales Promotion Committees, the Institute spreads the gospel of porcelain enamel and defends the name of the product from application to porcelain enamel substitutes.

Tentative Test for Abrasion Resistance.—W. N. Harrison. Mr. Harrison, who directs the test work on porcelain enamel at the United States Bureau of Standards, presented a method of determining the abrasion resistance of enamels. It was brought out in the discussion that acid-resistant enamels show more resistance to abrasion than ordinary enamels.

Chipping Resistance of Enamels.—Dr. Paul L. Smith. Dr. Smith, the Porcelain Enamel Institute research fellow at the Bureau of Standards, discussed his work on the mechanics and true nature of chipping of enamels. Enamel more than .0015 inch thick (ground coat .0003 inch and two cover coats of .0006 inch each) chips readily at points of stress. The internal stress and tendency to chip is increased by firing the ground coat at temperatures higher than necessary to fuse the enamel.

Factors Affecting Sag Resistance Properties of Enameling Iron.—Frank R. Porter. Six general factors affect sagging of enameling iron: 1. chemical analysis of the iron; 2. temperature to which sheet is heated to fire the enamel; 3. gauge of the enamel stock; 4. distance between supports in the enameling furnace; 5. duration of heating; 6. physical characteristics of the sheet iron. Sagging increases considerably if the ground coat is fired above 1600 degrees F. There is no increase in sag due to the vibra-

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H. S. BACON, Office Mgr. Sales Dept.
Minnesota Mining & Mfg. Co., Boston, Massachusetts

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ARCHIE P. GORDON, Salesman
Watson-Standard Co., Pittsburgh, Pa.

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FINISHING PLANTS AND EXECUTIVES DOING
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tion of the chain on a continuous furnace.

Methods of Testing Enameling Stock.—W. A. Alexander. Routine tests of enameling iron to determine ground coat adherence, ground coat pickup, sag resistance, delayed fishscale tendencies, blistering tendencies, surface defects, and other properties are made and the results compared to accepted standards.

Discussion of One Cover Coat Ware—E. C. Aydelotte. The conditions necessary to produce one cover coat ware are: proper design with maximum radii and no sharp edges on corners and ends; fairly heavy gauge metal; perfect ground coat preferably applied in a circulating ground coat system; rigid control of operations and raw materials; good handling facilities. Rejected ware (usually 10 to 40 percent of the total production) is difficult to reoperate and hold to a color standard, but stabilizing oxides can be used to reduce this hazard. To produce one cover coat ware, a super-opaque frit milled with 2 percent tin oxide and sprayed at 45 grams per square foot is used. The frit must have a good burning range and good working properties. Inspection standards are necessarily lower for one coat ware than for two cover coat ware.

Ball Milling Practice.—A. H. Burnham, Jr. and H. Sechrist. A definite relation between the size of mills, speed of mills, size and amount of balls, amount of enamel charge and amount of enamel remaining in the mill, amount of water used, fineness desired for most efficient milling exists, and a certain combination of ball sizes produces the best milling in each case.

Sources of Enamel Shop Waste.—W. F. Findlay. Sources of waste of the enamel itself were itemized. To minimize loss, it was recommended that mill room operators and sprayers be made waste-conscious and trained in the proper handling of equipment and raw material.

Black Specking of Hollow-ware—E. C. Dexheimer. The black specking of hollow-ware was attributed to a combination of factory conditions and not to any single cause. Careful control of operations was offered as the best remedy.

Control Methods for Gray Enamelware Manufacture.—H. D. Carter. Control methods for this type of enameling were outlined completely from the original smelting of the enamel through milling, drying, and firing.

Problems in Milling and Application of Dry Process Enamels.—Frank J. Zvanut. The chief problem in working dry process enamels was declared to be iron contamination. Milling is very critical and the health hazard great as compared to wet process enamels. Continuous milling and air classification are used with difficulty. Control methods are not very satisfactory, and it is very difficult to set proper standards of fineness for the enamel. Air conditioned mill rooms and improved magnetic separation of iron from the frit were visualized as solutions of the problems in dry process enameling.

Automatic Blasting.—E. B. Rich. Airless grit blasting in a tumbling barrel and on a rotating table was discussed and illustrated by motion pictures. The table blasting can be done on a rotating table or on rotating hooks on a chain conveyor. Steel grit of 30, 45, or 60 mesh fineness should be used. The cost of tablasting cast iron was estimated at $2 20 per 1,000 lb. of iron including labor, maintenance, and material used.

Some Observations on Dry Process Enameling. — E. E. Howe. Slides made from photomicrographs of various dry process enamel defects were presented. These defects were attributed to one or more of the following impurities: 1. molding sand; 2. aluminum paint; 3. carborundum; 4. titanium; 5. burning tool scale; 6. cast iron; 7. steel; 8. zinc; 9. coke; 10. carbon; 11. antimony; 12. iron; 13. powder; 14. colors.

Color Matching of White Parts.—G. H. McIntyre. The color matching of regular production parts and rerun work has always been difficult. Special enamels or stabilizing oxides can be used to help solve the problem.

Circulating Ground Coat Systems.—Ray Harner. A system of pumping ground coat through a screen and magnetic separator back to the dip tank was described. The advantages of this treatment are that the ground coat is always uniform, and dirt, frit, and iron particles are removed continuously.

Burning Tools for Enameling.—D. W. Talbott. The various alloy irons on which enamel ware is fired were discussed. The enamel industry uses more special designs of alloy burning tools than any other industry. A streamlined design for the burning alloy tools is recommended.

Relationship of some Welding Practices with Certain Enamel Defects.—J. J. Canfield and Alva Taylor. Hairlines in enamel may be caused by: 1. thin spots of metal in a weld; 2. unwelded, overlapped metal; 3. spot welds spaced too far apart; 4. warping from insufficient localization of heat; 5. heavy lugs or thick sections. Chipping may result from a crevice produced in the welding operation. Fishscaling may result from surface irregularity on welded areas. Overoxidized and porous welds frequently cause boiling.

Comparison of English and American Enameling Practice.—C. P. Stone. Cast iron enameling is the chief concern of English enamelers. The enamel is ground very fine without clay, applied with a brush instead of a spray gun, and fired usually in a box furnace. All cast iron enamels are applied direct to the iron without the matte ground coat used frequently in America. Acid-proof, leadless cast iron ware in four colors is produced 80 to 100 percent perfect.

Automatic Spraying and Brushing Equipment.—J. F. Roche, Jr. Automatic spraying may be done on a flatware conveyor or on a chain conveyor with revolving hooks. The production possibilities are: full automatic—1700 square feet per hour; semi-automatic —1,000 square feet per hour. This compares very favorably with hand spraying at 725 square feet per hour. The viscosity of the enamel and air pressure used must be controlled very closely. The reference to automatic brushing is misleading since there is no automatic brushing.

Flash and Roll Seam Welded Assembly for Enameling.—C. G. Bassler. New methods of resistance welding were discussed. "Shot welding" is spot welding with high current values and short timing to produce uniform welds and reduce surface disfiguration. By the Hart process, one tube can be welded cleanly to the side wall of another tube at any angle. Mash seam welding is a form of roll seam welding in which the welded laps are mashed together to form a single metal thickness. In flash butt welding, an arc is established between the edges of the metal; then these hot edges are forced together and the weld formed.

Inspecting Enameled Pipe at Low Cost

By G. F. MAUGHMER
General Electric Company, Los Angeles

SOME ancient philosophers believed that they saw with the aid of long invisible tentacles which shot forth from their eyes and caressed the surface of the object at which they looked. Reminiscent of this ancient tentacular theory of seeing is the modern method of measuring the enamel thickness on steel pipe. Today, through a new device incorporating the enamel-thickness gauge developed by the General Electric Company, silent, invisible fingers of magnetic flux go groping through enamel films on steel water pipes and report back the thickness of the film with accuracies of one-thousandth of an inch. Here is a paradox for the mechanic of a decade ago. Micrometer accuracy in measuring the thickness of a sheet of material when only one side of it can be physically reached or seen.

Mr. Harry Hayes in the Feld Engineering Laboratories of the Water Department of the City of Los Angeles is responsible for suggesting the use of the electro-magnetic thickness gauge in measuring the thickness of enamel coatings on steel water pipe. Confronted with the problem of inspecting some 13,000 feet of 24- and 36-inch enameled steel pipe during the processes of manufacture, Mr. Hayes did some thinking. For instance, he calculated that each 30 foot section of 36-inch pipe repre-

Fig. 1 — Illustration showing method of applying the G. E. gage for measuring the thickness of an enamel coating on a section of pipe.

sented some 570 square feet of surface counting both inside and outside area. His specifications called for an enamel thickness between the limits of 100 to 150 mills inside and 80 to 120 mills outside. His job was to see that every square foot of pipe produced was enameled to these tolerances both inside and out.

Mr. Hayes considered the conventional method of stripping and micrometering samples of enamel at random. He did not like the idea. It would prove the thickness of only the actual sample taken, possibly one square inch. The number of samples which could be taken from each section of pipe was limited. At best only a few square inches of enamel could be checked on a section of pipe involving as much as 570 square feet or 82,000 square inches. Then each sample taken meant a patch and the whole process was slow and costly. Mr. Hayes thought there must be a better way.

In a technical magazine an article about the electromagnetic thickness gauge was noticed. This instrument had been developed for the purpose of measuring without destroying the enamel coating on refrigerator cabinets. It was a far cry from a glistening white enamel refrigerator cabinet to a 36-inch steel pipe coated with black coal tar enamel but with experimentation the problem was solved. And so action followed imagination. A thickness gauge was adjusted to meet this problem and with it the Los Angeles City inspectors have done a better job, more quickly, accurately and easily. It has been possible to measure almost continuously the enamel thickness of each section of pipe. As the newly enameled pipe rotates in the special enameling centers the inspector walks slowly along the pipe holding the sensitive "head" against the rotating pipe and the instrument in his hand gives him a continuous indication of enamel thickness.

And so, through the imagination of Mr. Hayes, it is now possible to literally take thousands of readings of the enamel thickness on every pipe section, without destroying the film or wasting time. Through this close and accurate method of measurement the fabricator has been able to improve his technique and produce a more uniform coating and the City of Los Angeles has been able to do a better inspecting job for less cost.

"Control Instruments for Gas-Fired Ovens and Furnaces". This is the title of a bulletin describing control instruments for the protection of gas-fired ovens and furnaces which is now being issued by The Bristol Company, Waterbury, Connecticut.

A copy of this bulletin will be sent free upon request.

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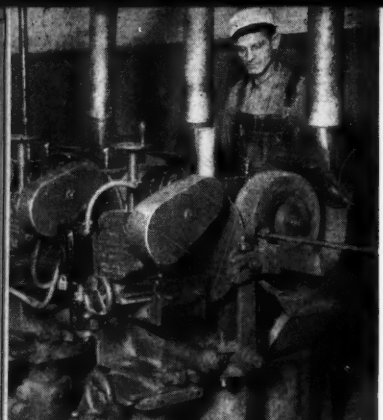

Practical Applications of MODERN Equipment

Unique Oven Design

A novel heat distributing, air circulating and recirculating system is incorporated into the design of this oven which is used to bake all types of finishing on air conditioning units.

Confronted by a loading problem which required large sheets to be hung vertically at one time and laid horizontally at others, the engineers of Despatch Oven Company, 622 Ninth St., S. E., Minneapolis, Minnesota, arranged this oven with a novel "Dual" heat circulating and recirculating system.

When sheets are hung vertically the heat is introduced at the bottom and passes vertically through the sheets, causing the finish on each sheet to be

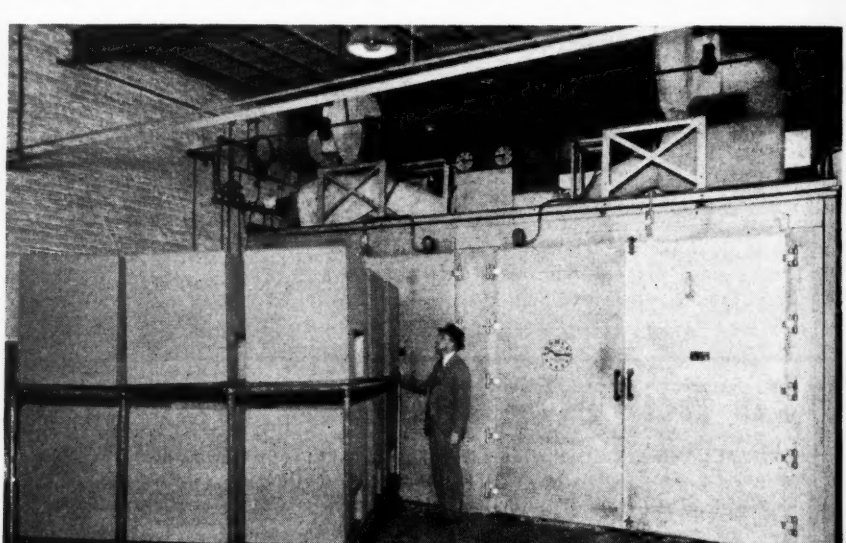

Illustration showing an oven of unique design in which is incorporated a novel heat distributing, air circulating, and recirculating system.

baked evenly and quickly. When the sheets are laid horizontally, a simple adjustment causes the heated air to pass from between the sheets, and again fast, even baking is obtained.

In conjunction with this novel oven system, an externally mounted direct gas heated system with large capacity fan for forcing heated air into the oven ducts is used. There are numerous recirculating air changes in the oven, and in addition there is sufficient exhaust to remove volatile fumes as quickly as formed.

This oven design is applicable to all types of batch finishing ovens as well as conveyer ovens and is recommended to those manufacturers who have a variety of parts which do not permit easy flow of air around the surfaces under all loading conditions.

Magnus Vapor Cleaner Catalog. Magnus Chemical Company, Inc., 10 South Ave., Garwood, N. J., is now issuing a descriptive folder which illustrates and describes Magnus Vapor Cleaner.

Magnus Vapor Cleaner is said to enable effectiveness and speed to steam or vapor cleaning, combining the principles of soap washing with solvent cleaning. The combination of the two is said to result in fast and thorough "cutting" action.

Magnus Vapor Cleaner is available in two grades—Magnus 92-E for light duty cleaning and Magnus 94-E for heavy duty cleaning. Both are light brown pastes, quickly and readily soluble in water. They impart to the water a wetting, penetrative and solvent effect.

Copy free upon request.

Armored Industrial Floors. Finishing department managers annoyed with frequent production delays and costly repair bills caused by poor floors will be interested in the bulletin entitled "Armored Floors" now being issued by Snead & Company, 161 Pine St., Jersey City, New Jersey. This bulletin explains how trucking aisles, ramps, driveways, platforms and other traffic areas can be permanently and economically protected against wear and deterioration with Snead Armor Grids.

Snead Armor Grids are said to withstand rolling and sliding traffic and shock due to dropped objects. They are said to prevent dusting of concrete, rutting of mastic, and resist moisture, acids, chemicals and temperature changes. The grids can be installed for new floors as well as for resurfacing.

Snead Armor Grids are cast of special grey iron containing moisture and acid corrosion resisting properties, whose roughened side walls are said to bond perfectly with concrete or mastic when imbedded therein without the use of anchoring or fastening devices. This type of floor grid presents a pleasing symmetrical pattern which covers 41 per cent of the total floor area with armor and provides a non-slippery but smooth running surface in all directions. The grids absorb shocks and carry loads quietly.

Copy of this bulletin will be sent free upon request.

Permo Air Filters. The Independent Air Filter Company, Inc., 228 N. LaSalle St., Chicago, Ill., has just published a bulletin to be known as "Permo Air Filters" describing the "Permo" Flame-Proof Throw-Away Type Filter.

Permo Air Filter Frame Units are of ladder construction and are designed to accommodate a wide range of general ventilating and air conditioning requirements, as well as any special applications.

Bulletin P-405-31 describing and illustrating the Permo Air Filters in detail will be sent free upon request.

If you have a finishing problem of unusual difficulty.

If you are interested in checking your present schedule for economy.

If you are merely curious as to what we have to offer.

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NEWS of the Industry

Glidden Company Announces Purchase of Billings-Chapin Company

The Glidden Company, Cleveland, Ohio, has announced the purchase of Billings-Chapin Company, founded in Cleveland by the late Nathaniel D. Chapin. The purchase includes, inventories, accounts receivable, trade marks, brands, formula and good-will, together with the right to use the Billings-Chapin name.

A Billings-Chapin Division will be established by The Glidden Company to handle and develop the trade. This Division will be in direct charge of Mr. Ralph Bennett, president of the Billings-Chapin Company for the past year.

Inasmuch as the purchase did not include the plant and equipment of the Billings-Chapin Company, the manufacture of the Billings-Chapin line of paints will be transferred to the Glidden plants.

Ralph Fry Appointed to Ferro Enamel Staff

According to a recent announcement issued by Ferro Enamel Corporation, 4150 East 56th St., Cleveland, Ohio, Mr. Ralph Fry, formerly associated with Standard Sanitary Manufacturing Company, his been added to the staff of the Ferro Enamel Corporation.

Corrosion Processes and Corrosion Testing

Mr. F. L. LaQue of the Development and Research Division of The International Nickel Co., Inc., 67 Wall St., New York, N. Y., presented recently an illustrated talk before the New York Chapter of the American Society for Metals on the subject of "Corrosion Processes and Corrosion Testing". The meeting was held at the Building Trades Association, 2 Park Ave., New York City.

The subjects discussed by the speaker included the electrochemical nature of corrosion, galvanic and sea water corrosion and protective films of corrosion and methods of testing.

Oakite Service Divisions Hold Technical Sales Conferences

Two-day technical sales conferences are currently being held by various service divisions of Oakite Products, Inc., 30 Thames St., New York, New York. The essential purpose of these conferences is to keep users of Oakite materials acquainted with new developments and improvements in methods and materials that apply to their processing or plant maintenance cleaning opereations.

Under the direction of Division Manager J. C. Leonard, the Chicago Division convened at the Hotel Statler in St. Louis, November 18-19. The Detroit Division, headed by H. C. Duggan, gathered at the Hotel Statler in Detroit, November 21-22. The Northeastern Division met at the Commodore Hotel in New York, December 2-3, with Division Manager D. X. Clarin in charge. The Philadelphia Division, of which J. J. Basch is manager, is scheduled to hold their meeting at the Hotel Pennsylvania, New York, December 9-10. In addition to the 90 Oakite representatives, the conferences are being also attended by J.

A. Carter, H. L. Gray, Assistant Managers, and E. C. Rinker and Wm. A. Allison of the Oakite Technical Research Department. Date of the West Coast Division Conference will be announced later.

Subjects dicussed include cleaning before bright nickel and chrome plating, and cleaning and anti-rusting metal parts between various fabrication operations.

Dust Control Equipment Manufacturers Make Definite Progress At Fall Meeting

At a recent meeting of the manufacturers of dust control equipment held at the office of Tuscany, Turner & Associates, Penton Bldg., Cleveland, Ohio, a number of important decisions were made which are of interest to users of dust control equipment and manufacturers of allied lines of industrial machinery in connection with which dust control equipment is employed.

The Association has been working very closely with the American Foundrymen's Association Hygiene Codes Committee in completing codes for various services. The handbook on Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems developed by the A.F.A. committee, on which the Engineering Committee of the Dust Control Equipment Association supplied representation, was discussed further by the meeting. A definite program of procedure was developed for continued cooperation with the A.F.A. Hygiene Codes Committee in completion of the Metals Cleaning and other codes. The Engineering Committee of the Dust Control group will continue to work with the A.F.A. committee on any subjects which might suggest such cooperation.

The association's cooperation with the New York State Labor Department was considered in detail and further work in this direction planned. Report was also made of the Association's cooperation with the American Standards Association in connection with safety codes for exhaust systems.

It was shown in relation to the Dust Control Equipment Association's plans for developing Standards of Dust Control Practice that there was a fertile field for closer cooperation between manufacturers of industrial machinery requiring the use of dust control equipment and the manufacturers of dust control equipment. Certain work which has been undertaken in this direction has shown the definite possibility of improved service to the users of equipment and of others interested through a program of this type. Following through on this subject, the Dust Control Equipment Association is offering the services of its Engineering Committee to all manufacturers of industrial machinery in connection with which a dust problem arises. A closer working arrangement it is felt will produce uniformity in different directions based on observance of sound engineering practices and definite experience. Through this means the inconsistency in design of hoods and other auxiliary equipment can be eliminated.

Acheson Colloids Appoint Raymond Szymanowitz Vice-President

According to a recent announcement, Raymond Szymanowitz, formerly technical director of Acheson Colloids Corp., has been promoted to vice-president and technical director of Acheson Industries, Inc., technical development company for the Acheson interests. In his new capacity, Mr. Szymanowitz will continue supervision of all research activity of Acheson Colloids Corp., Port Huron, Michigan.

H. G. Danielson Joins Staff of Industrial Oven Division of American Machine & Foundry Company

According to a recent announcement, Mr. H. G. Danielson who has had twenty years' experience in oven and heating equipment has joined the sales staff of the Industrial Oven Division of the American Machine & Foundry Company, New Haven, Connecticut.

A. R. Soltis of U. S. Rubber Products, Inc., Expands Territory

Mr. A. R. Soltis, who has been handling sales of U. S. Royalite and Vulcanite grinding wheels in the Detroit district for United States Rubber Products, Inc., Mechanical Goods Division, 1790 Broadway, New York, N. Y., will include in his activities the Indianapolis and St. Louis districts. Mr. Soltis will continue to make his headquarters at Detroit.

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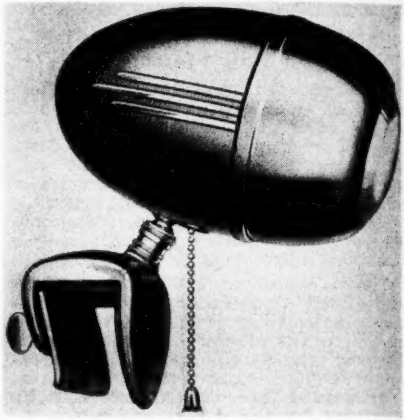
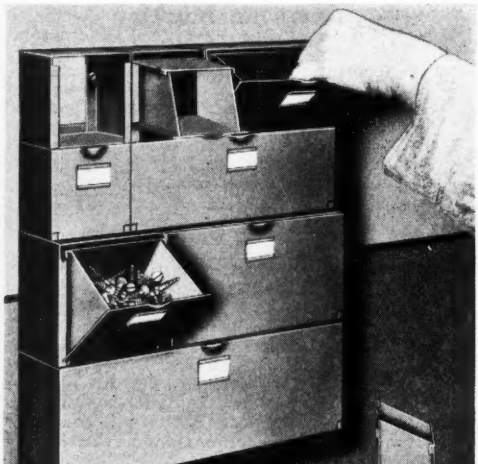


(Right)—This Moonbeam Spotlight which is designed for a myriad industrial applications is available in a variety of metallic lacquer finishes. A finish of this type lends sales appeal to a metal product.

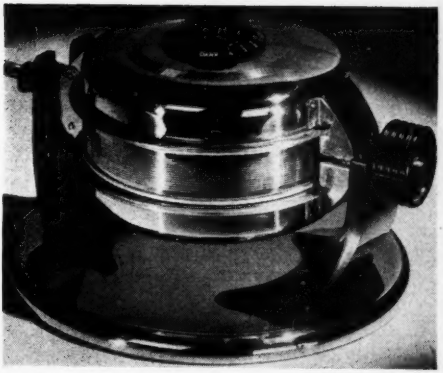
(Photo Courtesy F. A. Smith Manufacturing Co., Inc.)



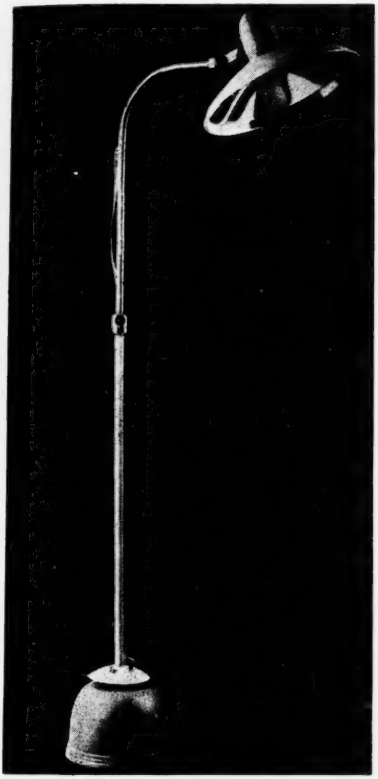
(Photo Courtesy Noggle Products Co.)

(Left)—A cabinet such as the one shown herewith can be used for filing small gadgets of all kinds. It is constructed of 26-gauge steel which is coated with a durable green enamel finish.

(Right)—The twin reversible waffle iron shown herewith is chromium plated—a finish that remains bright for a maximum length of time even when subjected to excessive heat.



(Photo Courtesy Modern Plastics Competition)

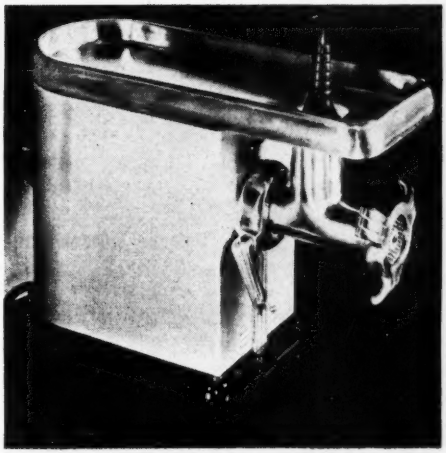


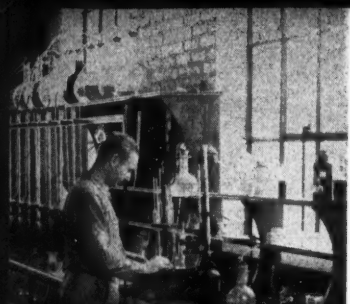
(Photo Courtesy Designers for Industry, Inc.)

(Left)—Alpine home sun lamps of the type shown here are finished in a two-tone crackle finish of either brown or blue.

(Photo Courtesy Lawrence Blazey)

(Right)—The materials of construction of this smartly styled meat chopper are of zinc alloy die castings. The trim castings are chromium plated. The base is of black porcelain enamel and the sheet steel body shell is finished with baked aluminum lacquer.





the FINISHING forum

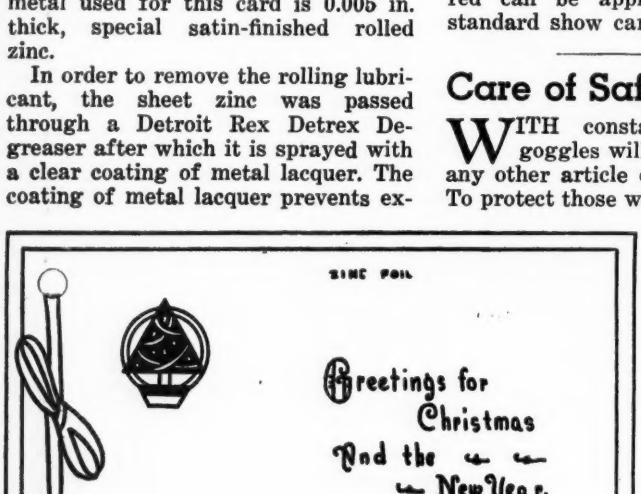
Christmas Greetings In Metal

By K. N. BANTHIN

THE illustration herewith shows how a Christmas greeting can incorporate the arts of metal rolling, product finishing, and printing. The metal used for this card is 0.005 in. thick, special satin-finished rolled zinc.

In order to remove the rolling lubricant, the sheet zinc was passed through a Detroit Rex Detrex Degreaser after which it is sprayed with a clear coating of metal lacquer. The coating of metal lacquer prevents excessive tarnishing of the satin-finished surface and also provides a smooth even surface which will absorb printing ink.

The printing on the card shown herewith was accomplished with the use of a special curved type plate on a regular letter size multigraph machine. Special colors of green and red can be applied by hand with standard show card colors.



Christmas Greetings in Metal

Care of Safety Goggles

WITH constant usage, safety goggles will get dirty, just like any other article of wearing apparel. To protect those workmen whose skins may become irritated or infected by dirt or other foreign matter, American Optical Company suggests the goggles be thoroughly cleaned or steril-

ized at stated intervals. They recommend the following methods:

1. Wash the goggles in a hot solution of soap and water. Scrub the eyecups, lens rings and side screens with a stiff brush. If the goggles are spotted with paint or tar a ten minute soaking in a solution of varsol will clean the surfaces. Next, soak the goggles for thirty minutes in a 3 per cent cresol solution. Then they should be hung on a support to dry.

2. Wash the goggles in a hot solution of alcoholic green soap, rinse in warm water and hang to dry.

3. Simply immersing the goggles in boiling water for five minutes has been found to accomplish sterilization satisfactorily.

4. Soaking for ten minutes in a solution of formalin made by placing one part of 40 per cent formaldehyde solution in nine parts of water is another simple and practical method.

5. Scour the goggles to remove all dirt and then submit them to a five minute exposure of ultra-violet light. This is usually done in the first aid room or emergency hospital of the company where equipment for doing it is maintained.

6. Another method is subjection to sterilization by a moist atmosphere of antiseptic gas, preferably formaldehyde, for a period of ten minutes at room temperature.

Use of Glycerine for Masking Cuts Cleaning Cost After Spray Painting

CLEANING the window glass of automobiles and railway coaches that have been spray painted is often a difficult problem. According to the information which was recently released by Glycerine Producers' Association, successful reports were reported by a large Middle Western electric railway and light company by the use of a glycerine solution as a mask. A solution of glycerine and whiting has been found to function the same under all weather conditions, with a marked decrease in time and effort to clean the windows of the units that are spray painted.

The solution of glycerine and whiting is brushed onto the window glass in the same manner that a mask would be applied.

To determine more exactly the overhead saving with the glycerine solution, the company made time studies on several types of cars. One type of car, which previously required 13 hours, required only 9 when the solution of glycerine and whiting was used.

Question: According to the information which we have been able to

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MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

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obtain, the best solution for deep etching stainless steel (18-8 chrome-nickel steel) is a mixture of approximately 4 parts of aqueous saturated ferric chloride, 1 to 2 parts hydrochloric acid and 1 part nitric acid, either with or without the addition of hydrofluoric acid. We would appreciate whatever suggestions you might be able to offer regarding the kind of solution which can be used for deep etching 18-8 stainless steel.

Answer: An etching solution which is found to be very satisfactory for deep etching 18-8 stainless steel consists of 625 grams of ferric chloride ($FeCl_3 6H_2O$) and 44 grams of ammonium chloride (NH_4Cl) diluted to 1 liter with water. When this solution is used at 28°C. (80° F.), a penetration rate of approximately .002 in. per hour is obtained with no evidence of pitting. Increasing the temperature of the solution from 55° to 60° C. (131° to 140° F.) will not give results which can be considered superior to those which are obtained at the lower temperature. The solution suggested should prove satisfactory, however, a slight adjustment in the amount used may give markedly different results.

Do you have a metal finishing problem?

Through the cooperation of outstanding authorities in the fields of metal cleaning, plating, burnishing, lacquering, and so on, Products Finishing is prepared to aid you in the solution of your finishing problem. There is no charge for this service.

Also . . .

If there is a "kink" or short cut in use in your shop, send in a description of it. . . . Each one published will be paid for.

Question: We are cadmium plating electric kitchen equipment. Recently we have been having trouble with a yellow stain on the cadmium plated work. This stain develops in about a month after the plating has been done. No changes have been made in our plating solution. We are using a weak nitric acid bright dip after the plating cycle. Please let us have your comments.

Answer: There are several possible sources of the trouble that you describe. One is that the cadmium-plated parts have been exposed to sulphide or sulphur fumes in service. If this is found to be the case, the parts might be covered with a clear dipping lacquer if the temperature at the point of service was not too high.

The parts may be subjected to too high a temperature in service. Cadmium-plated oven racks for gas ranges turn yellow in service either from the sulphur in the gas, in the food, or from the temperature. It seems to be a characteristic of the cadmium plate to do this when used in this type of service.

Another possibility is that the thickness of the cadmium is not great enough to prevent the rusting of the iron or steel base metal. The rust may be coming through the pores of the plate and producing the yellow stain that you describe. The only answer to this source of trouble is to put on more cadmium. It might be well to check the plating circuit for short circuits that may be keeping some of the current from doing useful work.

The stains may be the result of hard water stains put on the work

by the hot rinse after cadmium plating or after the nitric acid bright dip. To avoid these water stains, use ¼ oz. per gallon of potassium dichromate in both hot water rinse tanks.

If the cadmium plated parts are assembled in any way, the stains may be caused by perspiration. This is noticeable more often in plants where women are employed in the assembly department than in plants with all men employees. If this is causing the trouble, the parts can be coated with clear dipping lacquer just after being bright dipped and dried. However, the temperature to which the finished parts are to be subjected may be too high to permit the use of lacquer. A good dipping lacquer for this type of service will stand considerable heat before it will char or turn yellow.

General Electric Type TSA-14 Automatic Time Switch Bulletin. An automatic time switch for control of A-C or D-C circuits designated as the Type "TSA-14" is described in this bulletin which is now being issued by General Electric Company, Schenectady, New York. The Type TSA-14 Time Switch is an automatic repeating timer designed to control electric circuits without respect to the time of the day. Its useful field of application is wide and varied —from process timing to sign flashing.

The mechanism consists of a contact making mechanism, driven through a spur-gear train by a Telechrom motor. The contact making mechanism consists of brushes which bear on rotating cams. The silver contacts mounted on the brushes are snapped open and closed by means of steps on the cams.

The unit is housed in a die cast base and a glass cover which makes it suitable for either indoor or outdoor installation. The die cast base is equipped with a pipe nipple that is suitable for mounting in a knockout of any convenient junction box or switch box. The cover can be sealed by means of a standard seal wire through lugs on the base and the glass cover.

The silver contacts are rated 10 amp. at 230 volts. For circuits having higher ratings, a suitable relay should be used in conjunction with this timer. Special switches can be furnished to meet requirements which cannot be met with the standard forms. Copy free upon request.

"Blakeslee Metal Parts Washing Machines". This is the title of a 4-page folder which is now being issued by G. S. Blakeslee & Co., 19th St. and 52nd Ave., Cicero Station, Chicago, Illinois. The folder describes Blakeslee Metal Parts Washing Machines which are said to save both time and labor. The folder is very well printed and illustrated with various Blakeslee standard washing units.

The Blakeslee washing machines are recommended for washing stampings, punchings, deep draws, castings, metal assemblies, nuts, bolts, and screw machine products prior to painting, enameling, lacquering, plating, polishing, and so on.

A copy of "Blakeslee Metal Parts Washing Machines" will be sent free upon request.

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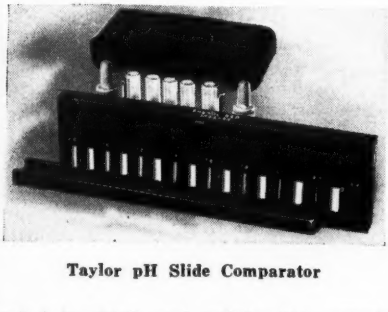
NEW Plant equipment and MATERIALS

Taylor pH Slide Comparator

A new slide comparator for colorimetric pH control of both acid and alkaline plating solutions has been developed and is now being marketed by W. A. Taylor & Company, Inc., 872 Linden Ave., Baltimore, Maryland.

The new unit is molded entirely from plastic. Changes in design have resulted in marked improvement in appearance, durability and ease of handling. In addition, the weight has also been reduced considerably. The pH values as well as the indicator names are engraved in white directly on the plastic slides. Improved catches are used to hold the top to the base and all metal parts are rustproof. The entire outfit, including the slide, is 10 in. long, 2⅛ in. wide



Taylor pH Slide Comparator

and 4 in. high and weighs 1½ pounds.

The Taylor pH Slide Comparator consists primarily of a slide and a base. Each slide contains nine color standards alternating with ampoules of distilled water. All color standards are guaranteed by the manufacturer to maintain their accuracy for a period of five years.

The base contains two vials of indicator solution, with 0.5 cc pipettes, 5-5 cc test tubes, and a piece of etched glass in a special compartment. Determinations are made by filling three of the test tubes with the test sample, adding 0.5 cc of indicator solution to the middle one, placing the slide on the base and moving it back and forth until the test sample matches one of the color standards. The pH value can then be read off directly from the values on the slide. One base can be used with any number of color standard slides.

Galvo-Cleen

A metal cleaning material which is said to form a zinc phosphate film that forms a bond on paint galvanized surfaces, to be known as "Galvo-Cleen", has been placed on the market by Nielco Chemical Co., 5405 Cicotte Ave., Detroit, Michigan. Surfaces can be painted with Galvo-Cleen without the danger of paint peeling off when the painted article is placed in service.

Agate Clear Lacquer

The Agate Lacquer Manufacturing Co., Inc., 11-13 Forty-third Rd., Long Island City, N. Y., has developed and is now marketing a clear, baking lacquer which is said to air dry in a comparatively short time. When baked at moderate temperatures for a short time, this lacquer is said to withstand blanking, forming, shearing and drawing.

According to the manufacturer, Agate Clear Lacquer will adhere to chromium and cadmium as well as brass, bronze,

silver, gold and so on without discoloring or dimming the metallic effect, and when baked will stand considerable wear and abuse. This lacquer is also said to withstand buffing.

Miller Polishing Wheel Adhesive

A synthetic adhesive for setting up polishing wheels has been placed on the market by J. C. Miller Co., 528 Lake Michigan Drive, Grand Rapids, Michigan. This adhesive is said to have excellent bonding strength, is flexible and is not affected by high temperatures. It can be used in connection with finishing and oiling operations. Miller Adhesive for polishing wheels is supplied ready for application and will not deteriorate on standing. Several grades are available, depending upon the abrasive that is to be used on the wheel.

Acoustilite

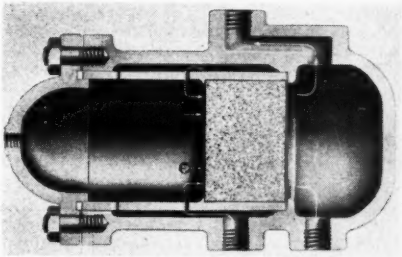
A tile-like material designed to reduce noise and echo in manufacturing and finishing departments, to be known as "Acoustilite", has been placed on the market by Insulite Company, Builders Exchange Bldg., Minneapolis, Minnesota. The tile-like material is furnished in squares and rectangles of various sizes and can be obtained in two finishes, one with the appearance of soft-surfaced stone and the other with open-mesh fabric covering.

Both types of Acoustilite are painted in a neutral buff shade and according to the manufacturer cold water flat paints used for further decoration will not impair the acoustical properties or insulating qualities of Acoustilite.

Fisher Air and Gas Filters

New filters, to be known as the Types No. 360 and No. 361, and designed to meet a demand for a highly efficient filtering device in gas and air lines, have been developed and are now being marketed by the Fisher Governor Company, Marshalltown, Iowa. The Fisher filters are said to remove foreign matter and separate free moisture from the air and gas pipe lines with a minimum friction loss. They are said to protect expensive air tools, machines, instruments and other devices against damages and costly service interruptions, while guarding and improving the quality of the finished product.

Fisher filters utilize extremely hard aluminum oxide crystals bonded together as a filter cement. This special manufactured filter element is both acid and heat resisting and is said to be unusually strong. Gases will pass through this type of porous filter with only a slight loss due to friction.



Fisher Air and Gas Filter

The filters may be installed in either vertical or horizontal pipe lines with standard pipe fittings. They are said to be unusually compact. These filters are designed to separate free moisture before gases pass through the element. This reduces the load and results in longer service life and less frequent cleaning. Suitable drain cocks are furnished. Flanged and bolted bottom castings permit easy and quick removal for cleaning.

The filter body is constructed of high-tensile iron, designed to give full capacity. These filters with screwed connections are available in sizes ¼ in. to 1¼ in. inclusive, and with flanged connections from 1½ in. to 2 inches.

Causticbond

Causticbond is a black resin compound developed by the Williams &

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Wilbur Company, Park Square Bldg., Boston, Massachusetts. Causticbond gives a black semi-gloss finish which is said to provide a protective coating for metal which is exposed to liquid acids or caustics. This material is recommended for lining tanks and protecting machinery from spillage. Causticbond is resistant also to chloride gases and alcohol.

Conveyorized Three-Dip Detrex Degreaser

As a recent addition to their line of standard automatic and hand-operated degreasers, the Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich., has recently developed and placed on the market the unit shown in the illustration. This machine is used for the removing of oil, grease, and dirt from all kinds of work, such as stampings, castings, and screw machine products prior to painting, plating, inspection and heat treating.

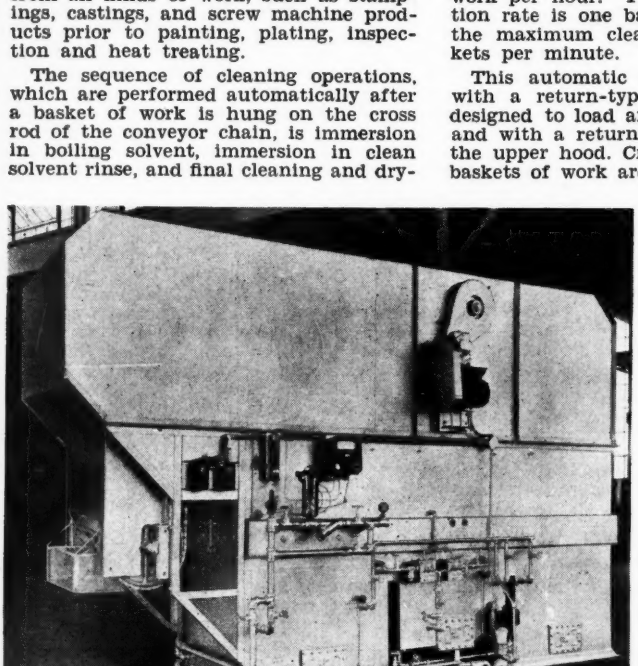
The sequence of cleaning operations, which are performed automatically after a basket of work is hung on the cross rod of the conveyor chain, is immersion in boiling solvent, immersion in clean solvent rinse, and final cleaning and drying in pure solvent vapors. The metal parts or assembled products are cleaned with stabilized non-inflammable, non-explosive safety solvents—either Perm-A-Clor or Triad. Following the degreasing operations, the parts are ready for finishing without any scrubbing or extra dryoff.

While the design of the new model Conveyorized Three-Dip Detrex Degreaser is built in several standard sizes, the particular unit shown in the illustration accommodates work up to 36 in. long x 15 in. wide x 15 in. deep and 20 in. hanging. The approximate overall dimensions of the degreaser are 12 ft. long x 6½ ft. wide x 10 ft. high. It has a total solvent capacity of 250 gallons and the approximate weight of the complete unit is 6300 pounds.

At a normal conveyor speed of 6 ft. per minute, the rate of production cleaning capacity is 2,000 pounds of work per hour. The minimum production rate is one basket per minute and the maximum cleaning rate three baskets per minute.

This automatic machine is equipped with a return-type cross rod conveyor designed to load and unload at one end and with a return flight of conveyor in the upper hood. Cross rods, from which baskets of work are hung, are spaced at regular intervals along the two-strand conveyor chain. A ¾ h.p. motor drive, speed reducer, and variable speed are mounted on the upper hood and drive the conveyor chain through the through-shaft and drive sprockets. A conveyor chain takeup device is located on the sprockets at the entrance-exit end. Oilless bearings are used on all sprockets inside the vapor zone.

The degreaser is fabricated from steel plate, reinforced with structural steel and is of all-welded construction. Inside surface is hot zinc spray coated following fabrication.



Automatic Three-Dip Type Detrex Degreaser equipped with cross rod conveyor, automatic control and arranged for loading and unloading at one end.

The solvent boiling chamber is heated by a steam jacketed bottom and steam coils. The machine is equipped with a safety steam pressure relief valve and also air-operated, vapor-actuated temperature indicator and steam control, complete with air filter and pressure reducer, by-pass piping, hand valves, strainer, and steam pressure gauge. It is also equipped with a motor-operated solvent transfer pump to return distillate from the third or vapor chamber to the boiling chamber. The transfer pump can also be used to transfer solvent into or out of the machine and between any of the chambers. Each of the three chambers—boiling chamber, clean solvent rinse, and vapor chamber—are equipped with removable clean-out doors.

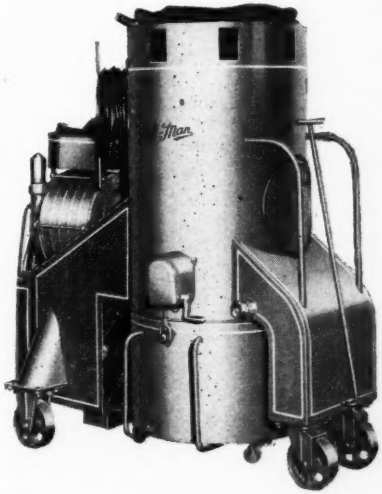
A water jacket condenser completely encircles the machine and is stayed and welded. A clean solvent collecting trough for collecting the distillate from the condenser encircles the inside of the machine beneath the water jacket condenser. The return line from the solvent collecting trough is equipped with two water separators and vapor traps. The distillate returns to the rinse chamber, thus continuously renewing it and keeping it clean during operation. The rinse, in turn, overflows into the third or vapor chamber, and this solvent overflow is returned to the boiling chamber by means of the continuously operated motor-driven solvent transfer pump. The pump is arranged with necessary piping so that the solvent can be transferred between any of the chambers in the machine and for filling or emptying the machine conveniently.

Creatasoap

A liquid which mixes with water for dissolving grease deposits on metal to be known as "Creatasoap" has been placed on the market by Creative Chemical Co., 4622 Friendship Ave., Pittsburgh, Pennsylvania. The material is non-inflammable and has no odor. Effective metal cleaning can be obtained by mixing one part of Creatasoap with fifteen parts of water. This solution can be applied to the surface being processed by spraying or brushing.

Hoffco No. 5 Super-Duty Portable Vacuum Cleaning Unit

The United States Hoffman Machinery Corporation, Air Appliances Division, 105 Fourth Ave., New York, N. Y., is now marketing a portable vacuum cleaning outfit especially designed for industrial uses. The unit is a completely equipped super-duty cleaner, designed to remove large quantities of accumulated dust with utmost economy. The cleaner is capable of many hours of continuous operation on heavy deposits of dust and dirt before it is necessary to stop work and empty the container.



Hoffco No. 5 Super-Duty Portable Vacuum Cleaning Unit

The dust container of the No. 5 unit is equipped with a raising and lowering device actuated by a crank handle. It is mounted on a separate set of wheels, independent of those on which the unit

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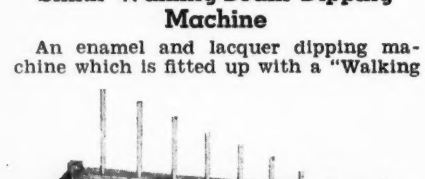
is moved, and the unit pull-handle can be detached and used to pull the container. Provision is made for carrying space on the unit for the hose and all other cleaning tools and accessories; thus all the accessories are placed on the unit and moved at one time. The unit has sufficient capacity to operate two lines of 1½-in. hose of different lengths simultaneously, or one line of 2-in. hose.

Smith Walking-Beam Dipping Machine

An enamel and lacquer dipping machine which is fitted up with a "Walking Beam" for the purpose of adjusting the dipping stroke is now being marketed by C. W. Smith, 46 Market Ave., N. W., Grand Rapids, Michigan. The Walking-Beam unit is designed for the purpose of automatically dipping all kinds of metal items. It is said to have a capacity of finishing up to 100,000 small items per day, depending upon the size and finish desired.



Smith Walking-Beam Dipping Machine

Finishing small items with the Walking-Beam Dipping Machine can be done with air-drying enamels and lacquers. The machine is driven by a ½ h.p. motor.

Flex-Rock Non-Slip Wax

In response to requests on the part of plant engineers for a wax which will give a gloss without a slippery surface, Flexrock Company, 800 N. Delaware Ave., Philadelphia, Pa., is now marketing a non-slip wax. The wax is made with pure carnauba wax with other ingredients to provide the non-slip feature. It can be applied to concrete, marble, ceramic tile, wood, linoleum, cork, wood blocks, and other surfaces and the manufacturer states that it can easily be applied with complete assurance that it will stick. Worn places may be rewaxed without going over the entire floor, and the wax can be scrubbed without injury. Flexrock No-Skid Wax is said to act as a protective coating and will last an unusually long time. The wax is applied with a cloth or mop and requires neither rubbing nor polishing. The lustre develops during the quick-drying process, and the wax is said to dry in 20 minutes.

Cadalyte Maintenance Compound

A compound for use in maintaining cadmium baths, to be known as "Cadalyte Maintenance Compound", has been developed and is now being marketed by E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Delaware. This material is recommended for use in place of sodium cyanide and is said to be a mixture of sodium cyanide and organic or inorganic brightening agents.

Du Pont Cadalyte Maintenance Compound is said to be so compounded that when used exclusively in place of sodium cyanide, the correct amount of each brightening agent as well as sodium cyanide is regularly and automatically introduced into the bath. The purpose of the Cadalyte Maintenance Compound is to keep the bath operating at maximum brightness and efficiency without the need for analyzing any of the ingredients except cadmium and sodium cyanide.

Hilo Metallic Rip-pl One Coat

Hilo Metallic Rip-pls which are said to give an attractive wave line effect and metallic sheen in one coat are now being marketed by Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, New York. This type of finish can be used on any non-porous surface and on fairly smooth metal without the use of priming, sanding and other preliminary preparations. One coat of Hilo Metallic Rip-pl is said to hide surface imperfections.

The appearance of Hilo Metallic Rip-pl

is attractive, dignified and sturdy. The colors available include copper, aluminum, brass, gold, silver, gray and bright gold.

MacDermid Anodex Process

A new method of metal preparation, to be known as the "Anodex Process", has recently been placed on the market by MacDermid Incorporated, Waterbury, Connecticut. The Anodex Process is the method of cleaning steel and copper plated work when racked prior to any finishing operation. The Anodex compound used in connection with the process is a white powder which is said to contain no moisture and is 100 per cent soluble in hot water.

For most cases, it is not necessary to purchase new equipment to install the Anodex Process, since it is used in steel tanks in the same manner as in ordinary alkaline cleaning.

For maximum efficiency, a temperature of 200 deg. F. and a current of 50 amperes per square foot and a concentration of 12 ounces of Anodex compound per gallon of water is recommended.

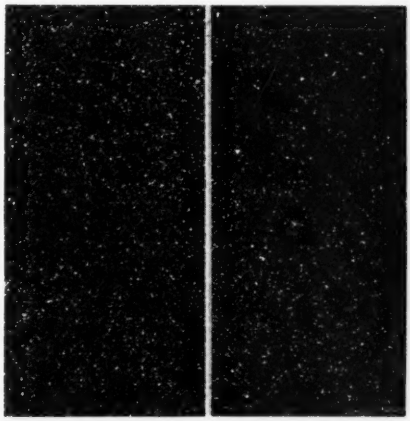
The Anodex Process is used only with reverse current, that is, the work to be cleaned is the anode rather than the cathode. The work to be finished can be taken directly from the stamping or buffing room, racked and put into the solution charged with Anodex compound for 30 seconds to 3 minutes, depending upon the degree of contamination. The workpieces may then be rinsed in cold water, dried, lacquered, japanned, or in the case of an electrodeposit, acid dipped, rinsed, and plated.

According to the manufacturer, only 5 minutes are required to check for the maintenance of the proper concentration of Anodex compound. The Anodex compound is packed in 450 pound and 100 pound packages.

One-Fire Porcelain Enamel Finish for Heaters

A porcelain enamel finish developed for heaters which can be applied by a one-fire method to be known as "Silverflake" has been placed on the market by Chicago Vitreous Enamel Product Company, Cicero, Illinois. This heater finish is said to provide all the durability of porcelain enamel at a marked reduced cost for both material and production.

Whereas porcelain enamel finishes have required first a ground coat followed by either one or two cover coats, each requiring a separate firing in high temperature furnaces, Silverflake is a ground coat oversprayed with a silverflake liquid.



(Left) Steel and (right) cast iron samples of Silverflake finish for heaters.

A single application and a single firing is all that is necessary to provide this porcelain enamel finish. The Silverflake finish has a dark background which provides an excellent contrast for the silverflakes. This type of finish can be applied equally well to either cast iron or sheet steel.

Jackson Type C Eyeshield

Safety engineers, personnel directors and production officials will be inter-

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Strictly first quality aluminum oxide abrasive grain manufactured in our own electric furnace plant. Specially prepared and treated for most efficient polishing performance. Write for samples.
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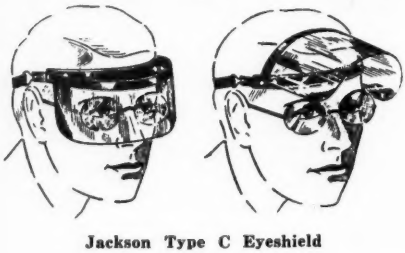
ested in an eye protection device designed for general industrial use and having the important advantages of lightness, wide range of vision, and generous ventilation.

The Jackson Type C Eyeshield consists of a flexible, transparent, non-inflammable visor obtainable in clear, smoked, light green, dark green or amber shades, adjustably hinged to a light headgear. No part of it rests on the nose or ears, making it very comfortable



Jackson Type C Eyeshield

to wear. It does not interfere with the mechanic's eye glasses if he wears them. Ample ventilation eliminates fogging. Protection is afforded from front and both sides by the transparent visor, which can be economically replaced if necessary. Hot metal rolls off this visor without marking it. The head band is equipped with a removable sweat band.

This shield, introduced by the Jackson Electrode Holder Co., 6553 Woodward Ave., Detroit, Mich., is said to provide ideal protection for workmen engaged in polishing and for general eye protection in industrial plants, for use in chipping operations and in many cases where the workman's eyes must be protected from flying particles.

A smaller eyeshield, designated as the Type D and available in the same shades, has a smaller visor which fits the face more closely, yet has adequate ventilation.

White Metal Lacquer

A white lacquer, designated as No. 131-W-1, for spray application on metal surfaces has been placed on the market by Standard Industrial Products, P. O. Box 323, Evansville, Indiana. This lacquer is said to be characterized by its ability to retain original color and by its adhesion to bar metal surfaces. This lacquer is supplied in drums and can be cut, part by part, with the usual lacquer reducers.

Beckman Industrial Model pH Meter

An industrial model pH meter has recently been placed on the market by National Technical Laboratories, Pasadena, California. The Beckman Industrial Model pH Meter is said to combine the accuracy of the glass electrode system with operating simplicity and overall ruggedness. It can be used with equal efficiency by technical and non-technical men, and will withstand the rough usage and severe operating conditions that are encountered in factory applications.

The operating principle is simple and positive. The glass electrodes are merely immersed in the test solution whereupon a minute electrical potential, varying with the pH, is generated in the electrodes by the solution. This potential is amplified by a special electronic amplifier, and at the touch of a button, operates a calibrated meter which accurately and instantly gives the exact pH readings. There are no charts to read, no comparisons to make, and nothing to compute.

The glass electrode system can be safely used in viscous or semi-solid substances and in rapidly circulating or flowing liquids. It allows accurate determination to be made in practically any solution regardless of color, viscosity, suspended solids, or chemical nature, which is said to be a feature of tremendous value in industrial work. The electrode system and lead wire are completely shielded—another exclusive feature—and may be used in vats, tanks, or any other location at a remote distance from the meter without danger of picking up electrostatic interferences.

Another feature of the Beckman Industrial Model pH Meter is its adaptability for making continuous indication possible in pH determinations. The electrodes may be placed in flowing solutions or in tanks where the pH is subject to fluctuations, and, by locking the button down, the meter will continuously and automatically indicate the exact pH of the solution, thus leaving the operator's hands completely free for recording, titration, or any other work.

A dual scale meter is used which gives a very high reading accuracy by providing ample separation between meter points. A switch is used to change the scale, and in the first position the full scale of the meter covers the acid range of 0 to 7 pH and in the second position, covers the full scale of the Alkaline range of 7 to 14 pH. This

arrangement spreads the complete pH range double length and permits readings to be made to 0.02 pH.

The Beckman Industrial Model pH Meter is entirely self-contained in a compact hardwood case. The cover is detachable for greater convenience and has a safety device which prevents the meter from being closed until it is completely shut off.

Frost-O-Lite Lacquer

A crystal finish for metallic surfaces, to be known as "Frost-O-Lite", has been placed on the market by Sanvin Chemical Products Co., 1617 21st St., Moline, Illinois. Coverage on steel is said to be approximately 400 sq. ft. per gallon when applied with a spray gun. The material covers in a single coat on most surfaces and air dries to a decorative crystal design, the size of the pattern being determined by adjusting the size of the spray gun. Any standard spray gun can be used.

Frost-O-Lite is available in single gallons, 5-gallon cans and 50-gallon drums. In addition to the 15 standard colors, Frost-O-Lite can be prepared to match any other color. A primer is also available when one is desired or required for use on extremely porous surfaces. A smooth surface is said to be the result when Frost-O-Lite lacquer finish is used.

CM "Comet" Hoist

The CM "Comet" Hoist illustrated herewith is said by the manufacturer—Chisholm-Moore Hoist Corporation, 140 Fremont Ave., Tonawanda, N. Y.—to combine the dependability of big scale hoisting equipment with compact, lightweight convenience. The Comet can easily be carried and installed by one man and is powered by a specially built heavy duty, high torque motor that runs on an ordinary light circuit or three-phase power line. All that is necessary to operate the hoist is to plug it into the socket. No special installation or accessories are needed. The hoist is a rugged, versatile tool which is said to save time and energy on smaller type hoisting operations where heavy equipment is costly and impractical.

The compact design and ease of operation make the Comet especially valuable for service on production lines in large plants. The construction of the hoist is compact and rugged, yet it is exceptionally light in weight. Precision ball bearings are provided at each rotating point. The gears are precision machined of heat treated alloy steel. A controller, with a patented "delayed reversing" feature, can be operated easily

CM "Comet" Hoist

with one hand and affords an extremely sensitive control for lifting the load distances a fraction of an inch.

The smooth, quick-acting, positive brake prevents drifting of the load and is easily adjusted. The Herc-alloy double-duty chain is extra strong, flexible and kink-proof. Upper and lower safety stops automatically limit travel of the load hook. The Comet is offered in four capacities: 250, 500, 750 and 1,000 lbs., and several speeds. The 500-lb. capacity model weighs only 85 pounds.

METALPREP
"Used First — Makes Your Paint Finish Last"
USED ON IRON, STEEL, ALUMINUM, GALVANEAL AND GALVANIZED IRON SURFACES.
Use Metalprep to clean and prepare all sheet metal surfaces before painting. Removes rust and grease.
Write for Literature
NEILSON CHEMICAL CO.
6564 BENSON ST. DETROIT, MICH.

Saylor-Beall Line Marking Machine

Safety engineers and production officials will be interested in a line marking

Saylor-Beall Line Marking Machine

machine for painting traffic lines on factory and warehouse floors, which is said to effect important economies by reason of its speed of operation and saving in paint and labor. The Saylor-Beall Line Marking Machine, manufactured by Saylor-Beall Mfg. Co., Detroit, Mich., enables an inexperienced operator to lay down from two to four miles of accurate, clean-cut line from 2 to 6 in. wide in an hour, against the normal record of 700 ft. per day by hand painting. A dual spray attachment is available for painting parallel lines. When equipped with an extra spray gun, cup and hose, the outfit is claimed to offer attractive possibilities in general maintenance work.

The equipment consists of a single cylinder air compressor driven by a gas engine, 12-gal, air-paint storage tank, and a pressure feed spray unit, all mounted on rubber-tired ball bearing wheels. The edges of the spray are cut off by articulated shields that are free to move vertically, thus making operation possible over rough surfaces. Flow of material is regulated by the operator through positive trigger control on the guiding handle. The pressure feed feature is said to insure a deeply penetrating, long-wearing line, and the efficient atomization result in savings in materials. Thorough cleaning without dismantling is provided by the use of an auxiliary cleaning tank.

Ferro Uni-Dry Clay

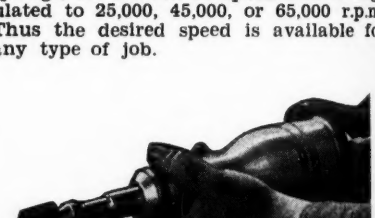
Ferro Enamel Corporation, 4150 East 56th St., Cleveland, Ohio, has recently completed installation of a new clay-drying and processing plant for clay which is to be marketed under the name of "Uni-Dri". Uni-Dri Clay is packed in small bags and the processing method is said to reduce moisture content to the lowest stable percentage and is also said to remove harmful impurities.

M-B "Heavy Duty" Air Grinder

The illustration shows the M-B "Heavy Duty" Air Grinder, now being offered by M-B Products, 130 E. Larned St., Detroit, Mich. The features of this grinder are the three stages of power and three ranges of speed, together with a simple governor which regulates the maximum speed.

Power is controlled by a series of three air jets and the grinder can be operated on any one of the jets. No. 1 jet makes available the minimum amount of power. No. 2 the intermediate stage and No. 3 the maximum volume, which is in excess of ¼ h.p. The air control is accessible and convenient, consisting of a knurled ring on the back of the body.

The three ranges of speed are obtained by the use of three different governor springs. By changing the governor springs, the maximum speed can be regulated to 25,000, 45,000, or 65,000 r.p.m. Thus the desired speed is available for any type of job.



M-B "Heavy Duty" Air Grinder

The grinder is packaged in a finished hard wood case. Included with the grinder are the following accessories: oil resisting air hose with dirt filter, six mounted grinding wheels, two drop forged steel wrenches, two speed change springs, one adaptor to permit the use of regular grinding wheels with ¼-in. holes, and one tool post adaptor.

FyeR-Ward Doors

A fire door of distinction and character, to be known as the "FyeR-Ward" door, has been brought out by Richards-Wilcox Mfg. Co., Aurora, Illinois.

This door is said to present an entirely flush surface on both sides, made up from steel panels about 10 in. wide, extending the full height of the door. This construction is said to permit the finishing of the door to represent a slab type door so that each panel can be grained to look like a wood door. The door panels are channel shaped interlocking members, with the legs of the channels forming the panels on each side of the door and staggered so that there is a flange every 5 in. measured in a horizontal plan through the full height of the door. These flanges extend through the full thickness of the door, serving as stiffening reinforcements. Steel rods, approximately 18 in. on center, extend through the door horizontally through holes in the flanges of the channels and serve to unite the two sides of the door into a rigid construction.

Advance Porcenite

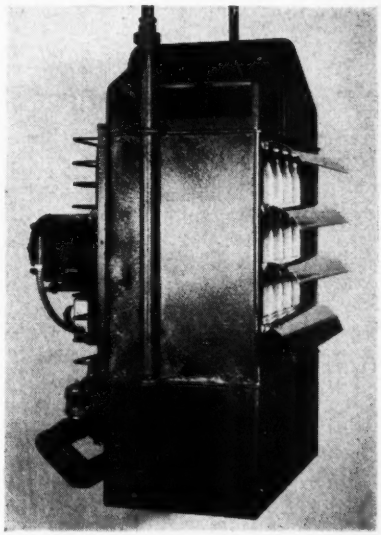
A one-coat bake finishing material that looks, feels and wears like porcelain, to be known as "Porcenite", has been placed on the market by Advance Paint Company, 545 W. Abbott St., Indianapolis, Indiana. Porcenite is said to be resistant to water, soaps and other alkalies and is a finish particularly well adapted for use on various household appliances including washing machines, ranges, refrigerators, and so on.

The white Porcenite is said to have remarkable resistance to yellowing. Baking temperatures will vary according to the time allowed in the oven. For light gauge metal, the suggested schedule is 200 deg. F. for one hour or 300 deg. F. for 45 minutes. The finish is hard when it leaves the oven. Porcenite is available in white, black and a variety of colors.

Pittsburgh Gas-Fired Unit Heater

A gas-fired unit heater, operating without steam or water and completely self-contained, has been placed on the market by Automatic Gas Steam Radiator Company, 483 Brushton Ave., Pittsburgh, Pennsylvania. The Pittsburgh Gas-Fired Heater, designated as "Series U", is said to be suitable for many types of commercial and industrial buildings such as manufacturing plants and finishing departments.

The Pittsburgh Gas-Fired Unit Heater can be suspended from the ceiling, out of the way, and employs natural or manufactured gas for fuel. In addition to heating, it may be adapted for other purposes such as ventilating, cooling and drying. The Pittsburgh Heater is available in five sizes ranging from 85,000 to 200,000 b.t.u. per hour.



Pittsburgh Gas-Fired Unit Heater

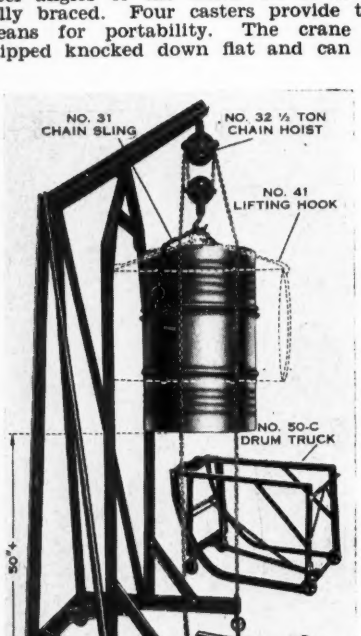
The operation and construction of the Pittsburgh Unit heater is quite simple. The gas fires into a combustion chamber and the products of combustion are passed upward through a bank of tubes and up through the rear of the housing. Air is passed around the tubes by means of a motor-driven fan located on the back of the assembly. The assembly includes a safety pilot which turns off the gas if the pilot goes out or burns too low to insure ignition.

Morse Portable Drum Crane

A strong, light Portable Drum Crane has been placed on the market by the Morse Manufacturing Co., Inc., 402 S. Franklin St., Syracuse, N. Y. The Morse Portable Crane will lift 55 gallon drums either flatwise or on end to a height of more than 50 inches in the clear. The

unit is built to handle one-half ton and is said to be capable of withstanding liberal overload.

The entire weight of the Morse Portable Drum Crane is 150 pounds. The steel angles of the crane are scientifically braced. Four casters provide the means for portability. The crane is shipped knocked down flat and can be



Morse Portable Drum Crane

set up by assembling with only 10 bolts. The total height is 9 ft. 6 in. and the base is 40 in. square.

Wright Hibbard Industrial Truck

A new electric high lift platform truck has just been recently developed by the Wright Hibbard Industrial Electric Truck Company, Phelps, N. Y. The truck has been designed with the ultimate feature of compactness in overall dimensions. The overall length of the truck with a 42-in. long loading platform is 89 in. and the overall width is 28½ in. with the average size of battery required.

Another desirable feature is the type of lift used, which involves the use of a pair of steel roller chains, insuring maximum efficiency in power consumption and long life of the lifting mechanism. This truck, with loading platform of 18 in. to 28 in. wide and from 34 in. to 53 in. in length and from 6½ in. high to 11 in. in low position, has a maximum lift of 72 in. from the floor.

Full details are described in Folder No. 5, which may be had by addressing the company at the above address.

Glyco Soaps

Two super-ammoniated fatty acid soaps have recently been developed for special uses by Glyco Products Co., Inc., 148 Lafayette St., New York, New York. These soaps are water dispersible and when applied, dry readily to give water repellant films of good lubrication value. They are said to be excellent emulsifying agents which give emulsions whose films do not re-emulsify after drying. In addition, they are said to have excellent detergent properties.

Commercially, these soaps are marketed under the names of S. A. Laurate and S. A. Stearate. The former is a transparent light colored paste and the latter is pearly white. In addition to being "soluble" in water, they will also dissolve in alcohol.

Acme Velunite

A metallic baking enamel of the synthetic type, suitable for either interior or exterior use, to be known as "Velunite", is now being marketed by Acme White Lead & Color Works, 8248 St. Aubin Ave., Detroit, Michigan. Velunite can be applied and handled in practically the same manner as the ordinary type of synthetic enamel. In sunlight, this finish shows an unusually rich metalescent effect, particularly in the blue and brown colors.

Velunite is available in various tints of colors, such as brown, taupe, gray, blue and green. Velunite enamel is designed to bake at 250 deg. F. for one hour. The finish can be applied to bare metal, but is said to present a better appearance when applied over a primed surface.

Rincon-Trol

A textured enamel for wrinkled finishes, to be known as "Rincon-Trol", which is said to possess high decorative values is now being marketed by Roxalin Flexible Lacquer Co., Inc., Box 7810

Elizabeth, New Jersey. Uniformity of finish without glossy spots or fish eyes, perfect texture formation and uniformity of repair by respraying are qualities ascribed to it. The final finish is highly resistant to marring, moisture, perspiration and abrasion, and when properly baked cannot be damaged except by mechanical means. Rincon-Trol is available in all colors except white—ivory is the lightest.

Calrod Heating Element

An electric heating element to be known as "Calrod" for application in industrial ovens requiring air temperatures up to 1,000 deg. F. has been placed on the market by General Electric Company, Dept. 6X-201, Schenectady, New York. The Calrod element is designed for use in hotplates and as an attachment on metal surfaces. Standard ratings range from 750 to 3,500 watts and effective heating ranges are obtained from 18 to 48 inches. Other sizes and ratings are available to specification.

Bends of ½-in. radius can be made in the element.

Vitra-Carlite

A porcelain-like, short bake, synthetic enamel to be known as "Vitra-Carlite" has been placed on the market by Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, New York. This material is said to cover excellently in one coat when applied with a full smooth film. It may be used for brush, spray, dip or tumble application.

Vitra-Carlite is said to have excellent hardness and mar-proofness. It has chemical resistance, especially to solvents, oils, greases and so on.

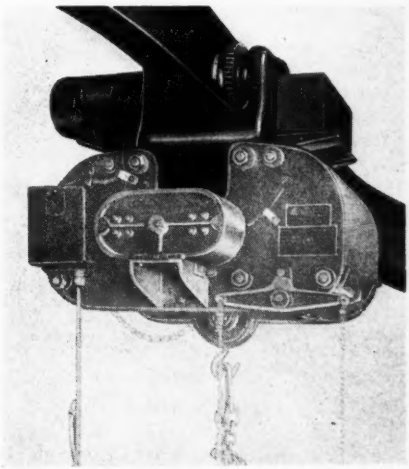
"Lo-Hed" Type RB Motor Trolley

American Engineering Company, Philadelphia, Pa., has announced the development of a new motor trolley, called the Type "RB". With this new trolley, it is now possible to obtain, at a moderate cost, a motor driven trolley Lo-Hed hoist in capacities of one to three tons.

The "RB" motor trolley is a separate unit sold either in combination with a Class "B" Lo-Hed hoist or sold separately for converting to any present Class "B" Lo-Hed hoist of the bolt suspension, plain trolley, or hand-geared trolley types to the motor-driven trolley type.

Features of the "RB" Motor Trolley are its short wheel base, low headroom, four-wheel drive and balance. Curves with a radius down to 7 ft. can be easily negotiated. Headroom varies from 1 ft. 9 in. to 3 ft. 10 in., depending on the capacity of hoist and height of lift. The four trolley wheels are all gear driven, providing maximum tractive effort. Balance is secured by means of an adjustable counterweight.

According to the specifications, all trolley wheel and gear shaft bearings are heavy duty Hyatt roller bearings. Gears are cut, not cast. The trolley wheels are cast steel with machined



Lo-Hed Type RB Motor Trolley

rolling surfaces. The motor is ball bearing, fully enclosed and designed especially for hoist service. The controller is of the drum type, fireproof, completely protected from dust and moisture. The controller is operated by pendant cords. Special controls are available. The motor trolley is readily attached to the hoist by bolts.

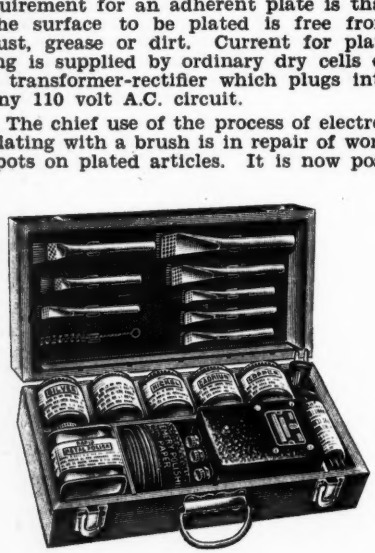
Rapid Electroplater

A device which is said to do electroplating as easily as painting with a brush has been developed and is now being marketed by Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago, Illinois. The plating compounds available are nickel, copper, brass, cadmium, tin, zinc, gold and silver. These com-

pounds are of jelly-like consistency that can be evenly applied on any object in any position without dripping or running. No acids or liquids are used.

According to the manufacturer, plating can be applied on all metals except chromium or aluminum. The only requirement for an adherent plate is that the surface to be plated is free from rust, grease or dirt. Current for plating is supplied by ordinary dry cells or a transformer-rectifier which plugs into any 110 volt A.C. circuit.

The chief use of the process of electroplating with a brush is in repair of worn spots on plated articles. It is now pos-



Rapid Electroplater

sible for industrial manufacturers to plate any specfic area without dismantling work to be plated. It is also stated by the manufacturer that any thickness of plating desired can be obtained. The Rapid Electroplater is available in a wide range of kit sizes, suitable for homes, workshops and industrial uses.

Unitank Flange

A connecting unit whereby pipes can be connected to either the inside or outside of a tank, to be known as "Unitank Flange", has been placed on the market by American Pipe & Steel Corp. 229 Date Ave., Alhambra, California. This unit consists of two parts. The flange body is tapped on both ends and threaded on the outside. It is inserted through a hole of the proper size from the inside of the tank. An outside piece, similar to an eight-sided nut with one face flanged out and finished, is attached by means of a left-hand thread.

A "Unitank Flange Cutter", a special tool to cut openings in tanks for the Unitank Flange, is also available. It is said to be simple to operate and will cut holes in metal up to 3/16 in. thick. The filange is available in pipe sizes from ½ to 8 inches.

Co-Res-Co

The Corrosion Control Corp., 208 Wright St., Newark, N. J., has placed on the market a coating material which is said to protect metal parts against corrosion to be known as "Co-Res-Co." This material is said to have a consistency similar to that of paint and can be applied by dipping, brushing or spraying. Co-Res-Co dries hard in 24 hours and covers approximately 600 square feet per gallon. This material can be applied after the removal of mill scale, loose rust or loose paint and is said to withstand a temperature of 650 degrees F. It is available in olive green and black.

Flexrock Primer

A bonding material to be known as "Flexrock Primer" for use with Ruggedwear, a floor surface for the finishing department, has been placed on the market by Flexrock Company, 800 N. Delaware Ave., Philadelphia, Pennsylvania. Flexrock Primer is processed with cellulose and is said to attach Ruggedwear to old concrete with a "tenacious grip". This primer is also said to be adaptable for attaching other floor materials.

Flexrock Primer is said to attach securely asphalt tile, and cold mastic materials. It will withstand vibration and is recommended for use where machinery causes excessive vibration in a floor.

Fulljet Spray Nozzles

A line of spray nozzles for metal cleaning, rinsing and various industrial washing operations has been placed on the market by Spraying Systems Co., 4922 W. Grand Ave., Chicago, Illinois. The nozzles, designated as "Fulljet", are said to deliver a penetrating, rain-like full cone spray with uniform distribution. The standard stock construction of the Fulljet Nozzles is brass. These nozzles are available in other kinds of metal when specified.

Fulljet Nozzles are available with removable internal vanes in female pipe connections from ⅛ in. to 3 in. ⅛ in. to ½ in. are made with removable cap. Capacities range from 0.5 to 120 g.p.m. at 10 pounds pressure.

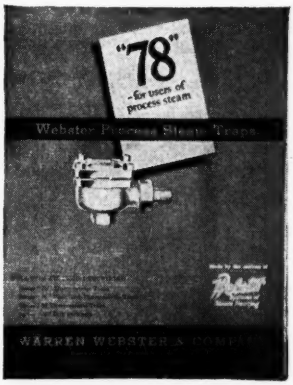
Marks Polarizer and Analyzer

An extra eye is said to be now available to technicians in the form of the "Marks Polarizer and Analyzer", which has been brought out by Laboratory Equipment Co., 148 Lafayette St., New York, N. Y. This instrument enables one to instantly detect defects and irregularities in transparent materials such as glass, rubber, plastics, and so on. In the case of opaque materials thin sections are made. In this way, ores, metals, alloys, and ceramics can be tested.

This instrument is said to facilitate the identification and grading of crystals, dusts, food products, plant fibres, lacquers, and many other substances. This device can be slipped into place on any microscope for instant use.

Webster Process Steam Traps

A complete data book on process steam trap applications is now being issued by Warren Webster & Company, 1661 Federal St., Camden, New Jersey. Webster Process Steam Traps are said to assure prompt, complete and continuous discharge of air and condensate from steam lines and steam-using tanks, ovens and other apparatus. No air binding or water logging is said to be encountered when this type of trap is used.



Webster Process Steam Traps Catalog

"New Wrinkles in Finishing Number Two." This is the title of an 8-page house organ which is now being issued by New Wrinkle, Inc., Mutual Home Bldg., Dayton, Ohio. Such metal parts as burial vault handles, sweeper tops, auto heater frames, radio loud speaker frames, and so on that are wrinkle finished are illustrated in this issue.

A short article describing the finishing operations on cash registers is also described in this issue.

Copy free upon request.

"Van Writing Up To Date". This is the title of a book written by W. H. Coates now being distributed by Chemical Publishing Company of N. Y., Inc., 148 Lafayette St., New York, New York. It is a comprehensive, informative book specially written for sign writers who would like to extend their field of activities to Van Writing, and for those who, though conversant with this particular branch of the trade, need a handy manual for consultation and reference, and for advice and information on up-to-date processes.

"Van Writing Up To Date" can be obtained for the price of $2.00 by writing to the distributor.

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for your CATALOG library

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Plating Barrel
The Udylite Plating Barrel is completely detailed in a bulletin published by the Udylite Company, 1651 E. Grand Blvd., Detroit, Mich.

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2. Spray Booths and Ovens
Newcomb-David Company, Inc., 5741 Russell St., Detroit, Mich., has issued a 24-page catalog illustrating and describing typical N-D Spray Booths, Industrial Ovens, Metal Booths, Washers and Ventilating Equipment.

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3. Black Finish To Steel
A 4-page bulletin outlining the Pentrate Process of applying an attractive, low-cost black finish to steel, through a process of chemical action. Heatbath Corporation, Springfield, Mass. See page 23.

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4. Metal Cleaning Hints
An interesting bulletin giving details on Metalprep Rust and Grease Remover. Tells how Metalprep makes metals safe for paint. Neilson Chemical Co., 6564 Benton St., Detroit, Mich. See page 55.

5. Parker Processes
Parker Rust-Proof Company, 2172 East Milwaukee Ave., Detroit, Mich., is now issuing a new booklet describing various applications of their unique processes of Parkerizing and Bonderizing, their rust preventive processes. This very attractive two-color booklet describes these two processes and cites many instances when they have solved the rust preventive problem.

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6. Industrial Ovens
A method whereby oven costs can be reduced, the production improved and oven operations accelerated is described in the 4-page catalog now being issued by The Kirk & Blum Manufacturing Co., 2816 Spring Grove Ave., Cincinnati, Ohio. See Second Cover.

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7. Micro Supreme Stop-Off Lacquers
A 4-page folder describing stop-off lacquers for insulating plating racks used in decorative plating and for masking parts to be hard chromium plated now being issued by Michigan Chrome Company, 6342 E. Jefferson Ave., Detroit, Mich. See page 11.

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8. Automatic Polishing Machines
The Packer Machine Co., Meriden, Conn., has issued a catalog illustrating and describing the Packer line of automatic polishing and buffing machines.

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9. Industrial Ovens
Two new bulletins giving full particulars on air heaters and industrial ovens. J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y.

10. Metal Finish
"The Answer Is Polymerin" describes in detail the wide applications of Polymerin to interrelated research through which this finish was developed. Ault & Wiborg Corporation, 75 Varick St., New York, N. Y.

11. Filter Presses
A folder completely illustrating and describing the new Miller filter press, giving industrial applications and engineering features is being issued by the J. C. Miller Co., 55 Mt. Vernon Ave., N. W., Grand Rapids, Mich. The Miller diaphragm pump is also illustrated and described.

12. Safety Goggles
Complete Safety Catalog illustrating and describing every style and type of goggle for dusts, chipping, grinding, welding, polishing and acids. Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y. See page 21.

13. Tumbling Equipment
A new bulletin giving information on tumbling equipment and tumbling compounds for metal-finishing in mass production. Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York, N. Y. See page 27.

14. Technical Information on Monel, Nickel and Nickel Alloys
The properties and uses of Inconel are concisely described in this catalog which is now being issued by the Development and Research Division, The International Nickel Company, Inc., 67 Wall St., New York, N. Y.

15. Magic Tack Rags
Folde describing the advantages of using tack rags for improving finishes. Wm. A. Juergens Co., 4036-40 Lagrange St., Toledo, Ohio. See page 45.

16. Production Polishing Equipment
New bulletins have been issued, giving descriptions and specifications of various types of production polishing machines. Acme Manufacturing Co., 1641 Howard St., Detroit, Mich.

17. pH Test Paper
Hydrion Bulletin describing wide range pH test paper which gives five distinct color ranges in range pH 2 to pH 10. A generous supply of sample test papers is included. R. P. Cargille, 118 Liberty St., New York, N. Y.

18. Analysis of Plating Solutions
A 24-page booklet containing methods of analyzing plating solutions in practical operations has been issued by Hanson-Van Winkle-Munning Co., Matawan, N. J.

19. Chemicals
The McGean Chemical Co., Cleveland, Ohio, has issued a 24-page catalog for users of chemical products containing a comprehensive list of the staple items manufactured and carried in stock.

20. Dust Collecting System
Complete information regarding the application of the Roto-Clone for eliminating dust problems. American Air Filter Company, Inc., 142 Central Ave., Louisville, Ky. See page 6.

Print plainly in filling out coupon for literature.

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